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Skeptical Inquirer
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+SPECIAL ISSUE

MEDICAL MISINFORMATION

Biases in Medical Publication

Food Babe's Bad Medicine

WHO's Disgraceful Strategy

Science's TCM Sections

Pesticide Fear Mongering

100 Chemical Myths

Urine/Saliva Pseudoscience

Dr. Paul Offit on Vaccines

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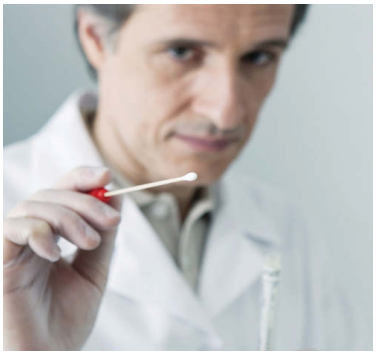

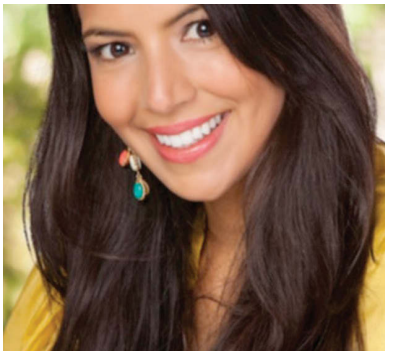

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Committee for Skeptical Inquiry
"... promotes scientific inquiry, critical investigation, and the use of reason in examining controversial and extraordinary claims."

[FROM THE EDITOR

A Special Issue on Medical Misinformation

We are in a period of extraordinary medical advances. So it is both ironic and unfortunate that at the same time there is also so much misleading information about them. It is a dangerous problem.

In this expanded, special issue on medical misinformation, our medical experts and investigators cut into the misconceptions and nonsense.

We begin with mainstream medical research, hardly immune. Morton E. Tavel, clinical professor emeritus at the Indiana University School of Medicine, says much of the hype about new breakthroughs is illusory. He examines some of the biases that reduce the accuracy of published medical studies. Most are unintentional, but that doesn't make them less serious. Publication bias (the preferential acceptance of studies with positive rather than negative outcomes), financial pressures, research errors, and fallacious research protocols contribute to "recurring waves of misleading and potentially dangerous false information."

Then we jump into the world of pop medicine and alternative and traditional medicine.

Mark Aaron Alsip, who writes the blog *Bad Science Debunked*, focuses on "Food Babe" Vani Hari, a new Internet phenomenon. Scientists have been debunking her wildly off-base, pseudoscientific assertions, but Alsip finds something else: The Food Babe has been earning sales commissions from products containing the same ingredients she claims are dangerous.

Two related articles tackle troubling institutional endorsements of traditional medicine. A trio of scientists from Sweden, the Netherlands, and Belgium (Thomas P.C. Dorlo, Cees N.M. Renckens, and Willem Betz) take on the World Health Organization (WHO) for what they call a disgraceful contempt for scientific medicine. At the start of 2014, WHO reinvigorated its strategy to boost the use of traditional medicine (TM). China, a major exporter of untested remedies, is pouring money into this effort, influencing WHO and other organizations. Our authors show how WHO's purposeful strategy is jeopardizing global public health. David Gorski of the Wayne State University School of Medicine excoriates the prestigious journal *Science* for publishing a series of sponsored (paid) sections on traditional Chinese medicine looking much like regular scientific papers. They were sponsored by two Chinese TM institutes and began with a laudatory piece by WHO's director-general. Such sections constitute a troubling trend toward misleading hybrids of commercial advertising and scientific publication—intentionally making the former seem like the latter. Respected journals should not be doing that.

Medical laboratory scientist Thomas Patterson examines a pseudoscientific "Reams urine and saliva test." He finds it diagnostic of nothing except gullibility.

We shift gears as physician/skeptic Harriet Hall examines the rhetoric about pesticides, where fear-mongering is abundant and scientific reason is in short supply. She also reviews *100 Chemical Myths*, a much-needed scientific response to knee-jerk chemophobia. Steven Novella, in his "Science of Medicine" column, explains why "science-based medicine" should replace "evidence-based medicine," which has inadvertently opened the gates for implausible remedies. Finally, Lindsay Beyerstein interviews noted physician Paul Offit, a leading proponent of vaccines.

He offers a timely reminder that the anti-vaccination movement endangers us all.

—Kendrick Frazier

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Boy Who 'Visited Heaven' in Best Seller Admits He Didn't

Benjamin Radford

A boy who survived a serious car accident and who later wrote an inspiring, best-selling book about meeting angels and God during his near-death experience admitted in January 2015 that he made it all up.

There are dozens of people who have claimed to visit heaven (or, less often, hell) during near-death experiences. The best-selling 2010 book *The Boy Who Came Back from Heaven* tells the story of one young boy's near-death experience: "In 2004 Kevin Malarkey and his six-year-old son, Alex, suffered a terrible car wreck. The impact from the crash paralyzed Alex—and it seemed impossible that he could survive. When Alex awoke from a coma two months later, he had an incredible story to share. Of events at the accident scene and in the hospital while he was unconscious. . . . Of the angels who took him through the gates of Heaven itself." It was one of two best-selling books about young boys' experiences in heaven that came out that year; the other, Colton Burpo's *Heaven Is for Real*, was made into a 2014 film.

Burpo's experiences in heaven may or may not be for real, but Alex Malarkey admitted that his is not. The website PulpitandPen.org noted that the book's publisher "Lifeway has been selling *The Boy Who Came Back From Heaven* for many years now. It is part of the trifecta of books on 'heavenly tourism' that Lifeway has sold and has promoted, along with *90 Minutes in Heaven* and *Heaven Is for Real*. The co-author of *The Boy Who Came Back From Heaven*—the boy himself—has written an open letter to Lifeway and admonished them for not holding to the sufficiency of Scripture, and has recanted his tale."

Malarkey's statement read in part, "Please forgive the brevity, but because of my [physical] limitations I have to keep this short. I did not die. I did not go to Heaven. I said I went to heaven because I thought it would get me attention. When I made the claims that I did, I had never read the Bible. People have profited from lies, and continue to. They should read the Bible, which is enough. The Bible is the only source of truth. Anything written by man cannot be infallible."

AP Photos

In 2015, Alex Malarkey recanted his earlier claim that he had visited heaven after a 2004 car crash.

Of course, the beauty of books about heaven—and there are many of them, some written by people who, like Malarkey, survived accidents and others by claimed psychics such as Sylvia Browne—is that nothing you write can be disproven. If a person claims to have had some personal experience with the unproven and unexplained (whether God or ghosts), we must simply take them at their word absent any compelling corroborating evidence. Or not.

Part of the reason that Malarkey's story was so widely believed and accepted among its Christian audience is that it reinforced their existing narratives and beliefs. If he had described heaven as a place that smells like melted cheddar cheese and was populated by winged elephants singing Britney Spears songs, his experiences—however sincerely conveyed—would have been dismissed as drug-induced hallucinations or the product of a fertile imagination. Though that may or may not be any more accurate than stereotyped visions of winged people in robes walking among clouds, by sticking closely to a widely accepted Christian interpretation of heaven, God, and demons, Malarkey assured that his story would meet his audience's expectations and be popular.

The book's publisher, Tyndale House/Lifeway, announced that it will stop selling the book. Any advertisements for paranormal or supernatural themed book or films claiming they are "based on a true story" should be taken with a grain of salt. The other books and accounts of meeting God and seeing heaven may be true and accurate, or they may be completely false and fictional. There is of course no way to know what the truth is. Whatever his reasons for coming forward, Alex Malarkey deserves credit for doing so; it would have been very easy to simply remain silent and enjoy the fame and notoriety.

Benjamin Radford is the deputy editor of the Skeptical Inquirer.

Neil deGrasse Tyson to Receive National Academy of Sciences' Top Award

He's been just about everywhere in the past few years: hosting the new *Cosmos*, conducting interviews, answering questions from the news media, tweeting to three million followers, and always demonstrating both the value of science and his enthusiasm about it.

Now astrophysicist, author, and science communicator Neil deGrasse Tyson, a Committee for Skeptical Inquiry fellow, will receive the National Academy of Sciences' Public Welfare Medal, its highest award. The award is presented annually "to honor extraordinary use of science for the public good."

The award recognizes Tyson's "extraordinary role in exciting the public about the wonders of science, from atoms to the Universe," the Academy said in its February 26 announcement. He will receive the award at the Academy's 156th annual meeting in Washington, D.C., April 26.

"Through just about every form of media available, Neil deGrasse Tyson has made millions of people around the world excited about science," said Susan Wessler, home secretary for the National Academy of Sciences and chair of the selection committee for the award. "Ultimately, the success of science depends on the public's understanding of its importance and value. Neil masterfully conveys why science matters—not just to a few, but to all of us."

"At a time when science is often misunderstood or ignored, Neil deGrasse Tyson is truly its most visible and most recognizable advocate," said National Academy of Sciences President Ralph J. Cicerone. "By personably and skillfully explaining the significance and the thrills of scientific discoveries, Neil has captured the public's imagination like no other scientist alive today. We are pleased to present him our highest award."

Tyson is the Frederick P. Rose Director of the Hayden Planetarium of the American Museum of Natural History.

The Academy touted his role as executive editor and host of *Cosmos: A Spacetime Odyssey*, a 2014 continuation of previous Public Welfare Medal recipient Carl Sagan's landmark 1980 television series, working with Sagan's widow Ann Druyan. It also mentions his hosting of StarTalk Radio and his frequent guest appearances on *The Daily Show*, *CBS This Morning*, and National Public Radio, plus his ten books, his eighteen honorary doctorates, and his NASA Distinguished Public Service Medal. Tyson recently completed the pilot season of the *StarTalk* television program, which will air on the National Geographic Channel starting in April.

Sagan (1994) and Eugenie Scott (2010) are previous CSI fellows to receive the Academy's Public Welfare Medal.

NCCAM's Name Change Fails to Impress

Kendrick Frazier

The National Center for Complementary and Alternative Medicine (NCCAM), a much-criticized unit of the National Institutes of Health, has changed its name. It is now the National Center for Complementary and Integrative Health (NCCIH).

A December 17, 2014, announcement said the revision was mandated as part of the new omnibus budget measure and followed public comments in May and June 2014. It defined *alternative medicine*—the part of the former name now dropped—as "unproven practices used in place of conventional medicine." But, curiously, the announcement went on to say "large population-based surveys have found the use of alternative medicine . . . is rare," an assertion that doesn't accord with the criticisms of physicians who closely watch and condemn the widespread use of non-science-based concepts and treatments.

The announcement defined "integrative health care" as "a comprehensive, often interdisciplinary approach to treatment, prevention, and health promotion that brings together complementary and conventional therapies" and said that is more common.

The name change, even when first proposed, didn't impress opponents of alternative medicine. Physicians David Gorski and Mark Crislip, writing on the Science-Based Medicine site back in May last year, called it "polishing a turd." Gorski said the name change is just another part of the "deceptive use of language that is at the heart of giving CAM the appearance of legitimacy."

The Center, whatever its name, has origins going back to 1992 when political supporters of alternative medicine in Congress pushed it into existence. It has been highly controversial ever since. Much of its research has verified, to no one's surprise, that various alternative modalities have no efficacy, but proponents of science-based medicine lamented the waste of the millions of taxpayer dollars spent studying highly implausible remedies. In the meantime, the very existence of the Center served to legitimize alternative medicine.

The Skeptical Inquirer has published a series of articles along these lines in recent years. Among them are detailed studies by Eugenie Mielczarek and Brian D. Engler of grants NCCAM has given to alternative medical institutes and universities for all manner of questionable ideas. These articles include "Measuring Mythology (January/February 2012), "Nurturing Non-Science" (May/June 2013), and most recently "Selling Pseudoscience: A Rent in the Fabric of American Medicine" (May/June 2014). Also relevant are Steven Novella's column "It's Time for Science-Based Medicine" and several other articles in this special issue on Medical Misinformation.

Kendrick Frazier is editor of the Skeptical Inquirer.

Indian Boy's 'Spontaneous Combustion' May Be Child Abuse

Benjamin Radford

In 2013, news spread around the world of a baby in Villupuram, India, who was admitted to a hospital with burns on his chest, head, and abdomen. Initially suspected of abuse or neglect, the baby's mother offered a strange explanation: her son Rahul had been burned in a case of mysterious "spontaneous human combustion" (SHC) in which people are said to inexplicably burst into flames.

The idea that people can suddenly catch fire for no apparent reason has been around for over a century. Despite the common belief, scientists have never proven that the phenomenon actually happens. Not only is there no plausible medical or physiological mechanism by which a person could generate enough heat to catch fire, but there exists no film or video evidence of it ever occurring. In most of the supposedly "mysterious" cases of SHC, the victim—often intoxicated and/or elderly or poorly mobile—was last seen near an open flame. Indian doctors could find no evidence that there was anything abnormal about little Rahul, and his burns soon healed. The boy returned to his home without further incident.

However, the parents of the same child have a new baby—who has also recently been taken to a hospital with similar burns. According to *The Times of India*, "The ten-day-old baby was brought to Kilpauk Medical College Hospital with 5% burn injuries on his feet and thigh after he allegedly caught fire on his own. The hospital has formed a committee to figure out what is causing the newborn to 'go up in flames,' as his parents claim. Doctors who treated his brother Rahul said the children could have been physically abused, possibly due to superstition. They recommended that police take a closer look at the case. Dr. Jagan Mohan, who treated Rahul at KMCH last year said, 'There is no such thing as spontaneous human combustion. When Rahul was admitted to the hospital last year we clearly told the parents that it looked like someone was deliberately setting the infant on fire."

Skeptical doctors also noted that when the child was under medical supervision there was no sign of any combustion, spontaneous or otherwise; the boy only seemed to suffer burns when left alone in the care of his parents. If one or both of the boy's parents are harming the children for sympathy or attention, it could be a case of a psychological disorder called Munchausen syndrome by proxy, in which a person (typically a parent or caretaker) acts as if a child has an illness, or in some cases may actually harm the child.

Shanmuga Velayutham of the Legal Resource Center for Child Rights said he believed that the family was injuring the child "to get sympathy and benefits from the government," noting that in 2013 when they claimed their son Rahul was a victim of spontaneous human combustion, the story made news around the world and garnered economic support from the government and others—including financial assistance and a new home. Why would the family need a new home? According to one early theory the boy's burns could have been caused by dried cow dung that was present in the family's rural hut and contains phosphorous, which has a low ignition point and might have ignited. A new, dung-free home was provided to them. However, this explanation, as well as spontaneous human combustion, has largely been discarded in favor of a far more likely, mundane, and tragic cause: parental abuse. Police are continuing to investigate.

Skeptical doctors also noted that when the child was under medical supervision there was no sign of any combustion, spontaneous or otherwise; the boy only seemed to suffer burns when left alone in the care of his parents.

India Today

Baby Rahul's parents claim he suffered from spontaneous human combustion, but evidence points to the more likely cause of abuse.

'Mother's Intuition' Claimed to Prevent Kidnapping

Benjamin Radford

On November 7, 2014, a Utah woman awoke suddenly with the sense that something was wrong in the house, and she and her husband were able to stop a man who'd just abducted their five-year-old daughter Lainey.

In a November 10 interview on *Good Morning America*, Stephanie Edson said that "We were asleep and I woke up—not to a noise, nothing woke me up . . . I looked at my cell phone because it was next to my bed and it was 4:07 A.M., and I remember thinking, 'I'm not tired, I'm awake, this is weird.' I was fully mentally alert. Because I was awake, I was able to hear the things that were able to save my daughter." She heard Lainey's voice, but when she went looking for her she realized to her horror the girl was missing. The father, Aaron Edson, ran outside and found Lainey with a stranger near the road at the end of their driveway.

The most likely explanation for why Stephanie Edson woke up is not some quasi-paranormal maternal sixth sense but one of the other five—specifically hearing.

The alleged abductor, Troy Morley, told Edson that he was in trouble, being pursued, and that he needed to take the girl with him to a church otherwise he would be killed. Edson, sensing that Morley was scared and mentally unstable but likely nonviolent, calmly asked Morley to return Lainey, which he did, as Stephanie Edson called police. Morley was arrested several blocks away after breaking into another home.

The case was widely reported as a clear example of a "mother's intuition" or "woman's intuition," something akin to psychic powers or a sixth sense. *The Washington Post*, for example, headlined "Mother's Intuition Helps Stop Kidnapping," and in a video interview on the *Washington Post* website, Aaron Edson stated that his wife "had . . . woman's intuition, a sort of gut feeling that she just needed to be awake." The couple also called the recovery of their daughter "miraculous" and an example of God's "divine providence."

Though the idea of women's intuition is common and popular in folklore, that explanation doesn't make sense in this case: If the presence of a menacing stranger abducting her daughter was what woke Stephanie Edson up (and not the sound of their footsteps, Lainey's voice, or something else), then why wasn't she woken up and alerted to the threat when Morley entered their house through an unlocked back door, or entered Lainey's bedroom, or picked her up out of her bed? Any number of horrific things could have happened to her child between the time that Morley broke into their home and the time a sixth sense alerted her that something was amiss.

Unfortunately for the beloved myth of a mother's intuition, the most likely explanation for why Stephanie Edson woke up is not some quasi-paranormal maternal sixth sense but one of the other five—specifically hearing. When we sleep, our eyes close and we may be unconscious, but we are still aware of our environment. We can hear things in our sleep, and we discount the familiar sounds we hear every day, including pets moving, a heater coming on, bubbling fish tanks, and so on. These sounds don't startle us awake because we consciously and unconsciously know that they are safe and routine.

But an unusual sound—such as a man's footstep in a hallway when your husband is in bed next to you, or a daughter's voice, or something else—will trigger an alarm and wake you up. According to a Salt Lake County Jail report, Morley "went through several rooms and 'rummaged through some items'" in the home, so it's a bit surprising that the Edsons didn't awaken earlier.

In fact, there's no need to guess what noise might have awoken Edson and alerted her to her daughter's kidnapping, because it's clearly stated in a little-noticed November 7 *Deseret News* article. Stephanie Edson woke up not because of any maternal intuition but because she heard their front door open: "The girl's parents woke up when they heard their front door opening. . . . 'We heard the front door open and I heard (my daughter) talking' she told the police dispatcher."

If Stephanie Edson told police just minutes after the abduction that the front door opening awoke her, why did she claim a few days later on *Good Morning America* that "nothing woke me up"? The most likely explanation is that she simply forgot or misremembered what exactly woke her up. The most important part of the story—their little girl's safe recovery—was the focus of their attention, and it wasn't until later that journalists seeking a news hook embellished or created the "woman's intuition" detail to the story. Lainey Edson's recovery, as wonderful and fortunate as it was, was the result of quick thinking by her parents and normal human perceptions, not a paranormal sixth sense.

Facilitated Communication Has Returned from the Dead

Kendrick Frazier

One of the hard lessons that skeptics and science-minded people have learned is that pseudoscientific concepts can be decisively debunked and yet pop up again later to gain new life.

That seems to be happening with Facilitated Communication (FC). This fad therapy was much the rage in the early 1990s in educational and clinical circles as a way of communicating with nonspeaking people with autism and similar disorders. By the end of that decade, FC had been convincingly refuted by controlled research studies, and the scientific community had rejected it. We reported extensively on that in SI at the time.

Now FC is making a return, and this has serious implications for psychology, psychiatry, and all allied fields. This is the central conclusion of a major new study by psychologist Scott O. Lilienfeld of Emory University in Atlanta and colleagues Julia Marshall of Emory, James T. Todd of Eastern Michigan University, and Howard C. Shane of Boston Children's Hospital. Their detailed new paper with 257 references ("The Persistence of Fad Interventions in the Face of Negative Evidence: Facilitated Communication for Autism as a Case Example") was published online February 2 by Taylor & Francis Group.

They show that this fad technique, despite lack of all scientific evidence for it, continued to thrive in underground form after being discredited and is now making its way back. Their study shows that FC has continued in academic and other institutional settings, popular books, peer-reviewed publications, the Internet, news and entertainment, and news media.

Now FC is making a return, and this has serious implications for psychology, psychiatry, and all allied fields.

They refer to the "potent allure of fad treatments for autism" and the "seductive appeal" of FC, which purports to unlock affected patients' hidden capacities. They discuss the reasons for this and the lessons for academicians and professionals. "Researchers should not presume that once a technique has been refuted by scientific evidence, it will necessarily vanish from the clinical scene." Because of the emotional needs they serve, such fads will persist unless they "meet with persistent opposition."

Lilienfeld and colleagues advocate for more sustained educational efforts to provide what they call long-term "immunization" against questionable claims regarding FC and other fad techniques for autism. There is especially a need for proactive education in scientific thinking among professionals in the special disabilities field, where there is enormous pressure to come up with hopeful treatments. They urge scientists in the communication disorders, psychological, and educational areas to become more vocal in their opposition to fad interventions; they have an ethical duty to speak out. Nevertheless, the authors caution everyone to beware of the "backfire effect," where merely stating that some belief is false leads to stronger adherence among believers. As Stephen Lewandowsky and others have shown, in order to be effective debunking of erroneous claims must be paired with an alternative—and ideally more compelling—narrative.

Thanks, *National Geographic*

Kudos to *National Geographic* for its March 2015 cover article "The War on Science." The issue reports on attacks on climate science, evolution, the moon landing, vaccinations, genetically modified foods, and more. *Washington Post* science writer Joel Achenbach wrote the eighteen-page article (on the inside it is titled "The Age of Disbelief"); Richard Barnes did the photography. (You can find the article and photos online.) It is regrettable that in today's climate it takes courage for a mass-market magazine to tackle these issues so forthrightly. *National Geographic* should be commended; it will undoubtedly get push-back from anti-science interests, so you might let the editors know of your appreciation.

Syrian Refugees: Flight Into the Unknown
MARCH 2015
NATIONAL GEOGRAPHIC
CLIMATE CHANGE DOES NOT EXIST
EVOLUTION NEVER HAPPENED
THE MOON LANDING WAS FAKE
VACCINATIONS CAN LEAD TO AUTISM
GENETICALLY MODIFIED FOOD IS EVIL
THE WAR ON SCIENCE

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David Morrison Honored with AAS Education Award

David Morrison, a Committee for Skeptical Inquiry fellow and an SI contributing editor, has received the American Astronomical Society's (AAS) Education Prize for 2015.

The AAS Education Prize recognizes outstanding contributions to the education of the public, students, and/or the next generation of professional astronomers.

Throughout his career, Morrison has been a prolific communicator of the results and values of science. He has been especially active in the past few years fighting unfounded fears of a nonexistent "rogue" planet causing an apocalypse in 2012, defending the results of climate science, and otherwise presenting the case for good science. Some of his efforts have appeared as articles and reviews in SI, but he has used many other forums as well.

Morrison's citation reads:

> For a lifetime of outstanding contributions to the understanding of astronomy by college students and the public and to the debunking of astronomical pseudoscience—through his textbooks, popular books, slide sets, websites, articles, public talks, and work with the media.

Morrison is a space scientist and longtime senior scientist at the NASA Ames Research Center. He will be given the award at the 2016 AAS meeting. Previous AAS Education Award winners include CSI Fellows Jay Pasachoff (2003), Donald Goldsmith (1995), Andrew Fraknoi (1994), and Carl Sagan (1992). Before 2000, the award was known as the Annenberg Prize.

The 16th European Skeptics Congress will be held at Goldsmiths College, University of London, from September 11 to 13, 2015. The Congress is jointly organized by the Association for Skeptical Enquiry (ASKE) and Goldsmith College's Anomalistic Psychology Research Unit (APRU).

Events will include keynote addresses by distinguished speakers, formal presentations, debates, and poster presentations, plus a pre-congress session and Skeptics in the Pub meetings in the evenings. A section of the Congress will cover research at APRU. Visit the Congress website below for up-to-date information concerning the program, registration and accommodations.

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Joe Nickell, PhD, is CSI's senior research fellow. He has worked professionally as a stage magician, private investigator, and scholar. Among his many books is *Tracking the Man-Beasts* (Prometheus Books, 2011).

Monster Lookalikes: Reflections of a Paranatural Naturalist

Over my years as a skeptical cryptozoologist—writing numerous articles and books about my investigations of strange creatures, as well as appearing on such television shows as National Geographic's *Is It Real?* and the History Channel's *Monster Quest*—I have taken a simple approach. I have found that it is often possible to identify a real, natural-world lookalike for a given fabulous creature, one that could be mistaken for it.

While a naturalist is one who studies the natural world using the methodology of science, I use the term *paranatural naturalist* to describe one who applies the naturalist's methods to mysteries of the paranatural with the intention of solving them. Here follows a generous sampling of my investigative work in this regard, focusing on "monsters" and other entities.

Lake and River Monsters

Some of the most famous of the world's mysterious creatures are those that reputedly inhabit inland waterways: the Giant Eel of Lake Crescent, Newfoundland; both Lake Champlain's long-necked "Champ" and its crypto-alligator; Lake Memphremagog's "Memphre"; and, of course, Scotland's famous "Nessie."

Giant Eel. Consider "Cressie," the legendary giant eel of Lake Crescent, Newfoundland, which I investigated for *Monster Quest*. Of the invariably daytime sightings, most involve a dark eel-like creature, up to twenty-five or more feet long, swimming with an up-and-down motion on the surface of the lake. Unfortunately, as I found (with the help of Aquarium of Niagara in Niagara Falls, New York, where I was once Animal Trainer for a Day), real giant eels instead swim with a side-to-side locomotion and are nocturnal bottom-dwellers. However, there is a creature with the required characteristics—namely multiple otters swimming in their undulating fashion, in a line, and so creating the illusion of a single giant serpentine creature slithering across the water (Nickell 2012).

"Champ" et al. In addition to the Giant Eel, otters also make some of the best lookalikes for other lake and river monsters. Indeed, the fact that otters swimming in a line can appear as a single great creature was observed in the Scottish river Clyde as early as 1930 (Gould 1934, 115–17). The illusion has since been confirmed elsewhere (Nickell 2007b, 6–7), and so this represents a very viable hypothesis in cases where the evidence warrants and where otters can exist. For example, at Lake Champlain a witness conceded that his sighting of "Champ" "could have been one large creature or four smaller ones"; significantly, the sighting was at the mouth of Otter Creek—an aptly named habitat to be sure (Nickell 2007b, 6).

Crypto-"Alligator." Not all lake monsters are otters, of course. On February 22, 2006, *Good Morning America* aired exclusive video footage of what a pair of Vermont fishermen encountered in Lake Champlain. As one man observed, "In one frame it almost looks as if the head of an alligator-like animal breaks the surface. . . ." Although neither saw the entire body, they estimated it to be ten to fifteen feet long and as big around as a man's thigh. I investigated the matter for LiveScience and suggested the men had seen the same sort of fish that French explorer Samuel de Champlain described in his journal in 1609. Champlain wrote that it was "as big as my thigh," resembling a pike with an exceedingly long snout and "dangerous teeth." I concluded that both the 1609 and 2006 sightings probably involved an alligator-resembling fish called a gar (one of the *Ganoidei* subclass, which includes sturgeons), either the longnose gar or much larger alligator gar. During one of my investigative trips to the lake, I interviewed a man who had just witnessed a friend hook such a "monster"-sized gar, measuring about six feet, four inches long. He dubbed it "Gar-gantua" (Nickell 2006).

"Memphre." As yet another curious lake creature, consider "Memphre," the resident monster of Lake Memphremagog, which is located largely in north-central Vermont but extends into Quebec. I have investigated its waters for a Montreal television documentary and for an article, in the latter case interviewing a woman who has had numerous sightings. In one instance, she photographed the swimming creature. The fisherman whose boat she was using told her he had earlier seen a beaver in the vicinity, but she seemed not

to make the connection when she subsequently told me how she had heard the monster make a slapping sound—as when, she indicated, one slaps the water with a hand. Of course, beavers produce just such slapping sounds with their tails to signal danger. But not all sightings of "Memphre" are beavers; one photograph of the creature turned out to show a moose swimming across the lake (Nickell 2004).

Loch Ness Monster. The world's most famous lake monster inhabits a loch (lake) in northern Scotland. There is not a single explanation for all the sightings that are lumped together and affectionately called "Nessie." Some are hoaxes (like the famous April 1934 Nessie photo), while others have been attributed to salmon and other fish, long-necked water birds, swimming deer, bobbing logs, seals entering from the sea via the River Ness (as confirmed to me by an information officer in Inverness), motorboats (seen from a distance), boat wakes, wind slicks, and more (Binns 1984; Shine 2006). In May 2007, a video of the alleged creature surfaced, and I was asked by CNN International and again by CNN's *Paula Zahn Now* to view the footage (by one Gordon Holmes) and offer an opinion. Subsequently, I debated cryptozoologist Loren Coleman on the latter show and suggested that the creature was probably a large European otter (*Lutra lutra*). Coleman would later call this "Otter Nonsense" and I would respond that "he otter know better." Subsequently, I had time to study the video more thoroughly with CFI video expert Tom Flynn. It appeared that the creature's size, speed (which caused a long wake), and undulating locomotion were quite consistent with a single otter (Nickell 2007c).

Sea Creatures

Incredibly more so than even the largest lakes, the ocean has the possibility of fantastic creatures—the prehistoric coelacanth, for instance, a fish once thought extinct, and the giant squid, the legendary "Kraken," that is now proven to exist. Here, I identify the likely real creatures behind a "mermaid" of early seventeenth-century Newfoundland coastal waters, and a sea serpent—dubbed Cadborosaurus—that today supposedly inhabits British Columbia's Cadboro Bay.

Newfoundland "Mermaid." In 1610, a Captain Richard Whitbourne and his men encountered a strange sea creature in the waters off Newfoundland. A decade later, in his *A Discourse and Discovery of New-found-land*, he described it as beautiful with a comely face, well-proportioned, and having "blew strakes" (blue streaks) on its head "resembling haire," with a squarish white back, and hands with which it attempted to climb into the boat. He did admit, however, that "whether it were a Maremaid or no, I know not; I leave it for others to judge." Now, sightings of mermaids or sirens are usually explained as sea cows (i.e., the dugong or manatee, both of the order *Sirenia*). However, I suggest Whitbourne and crew encountered a species of hair seal. For example, the harbor seal (*Phoca vitulina*) may indeed be white, have blue streaks on its head, and exhibit a mammal's face, shoulders, and "hands" (flippers) upon a fish's body (Whitaker 1996, 728–730). Although Whitbourne mentioned "ears," and the seal has no external ears, he may have erred in this detail, having seen what expectation led him to see—or to "remember" a decade later (Nickell 2011a, 208–209).

Sea Serpent: Cadborosaurus. Even at night, I can attest, British Columbia's Cadboro Bay is picturesque. And, if eyewitnesses can be believed, it is also home to a sea serpent that has been popularly labeled "Cadborosaurus" (after the bay and the Latin word *saurus*, "lizard"). Some sightings may have been sea lions or even seals—not multiple otters. Indeed, a witness in 1997 saw what at first "looked like three seals in a row," although he later convinced himself it was a single, lengthy creature—mistakenly, I suspect (Nickell 2007a, 22). Following the article I wrote on Caddy sightings, I received a letter from British Columbia skeptic Steve Koerner, who told how in 1996 he was on a cliff overlooking Telegraph Cove, just about a half kilometer further east from the bay. He spotted what appeared to be a great sea serpent coming toward the beach. Then he watched as one otter climbed out, "soon followed by the rest of the family" (Koerner 2007).

Hairy Man-Beasts

Especially of interest to humankind are hairy man-beasts: mythological beings seemingly from our evolutionary past. Here we look at widespread reports of North America's Bigfoot, as well as a supposedly malodorous regional variety, the Florida Skunk Ape.

Bigfoot. Mostly associated with the Pacific northwest, the legendary man-beast known as Sasquatch—but after 1958 generally called Bigfoot—is also reported from most states, notably Pennsylvania and Florida, as shown by analysis of abstracts of 1,002 cases from 1818 to 1980 (Bord and Bord 2006, 215–310). The data show the purported creature to be, on average, 7.57 feet in height. Now, a black bear (*Ursus americanus*) can be seven feet tall when it stands upright—something bears do, for instance, when trying to sense something—and the grizzly or brown bear (*Ursus arctos*) can be much larger. Indeed, Bigfoot's color variants (black, cinnamon, and other colors—even white) are similar to bears. Its behavior (such as sometimes running on all fours, visiting campsites and homes, feeding on such diverse things as vegetation and human rubbish, being active both day and night, and other actions); vocalizations (growls, etc.); and wilderness habitats are all surprisingly consistent with bears, as is the fabled creature's geographic distribution (Nickell 2013a). It is not uncommon for witnesses to state that at first their Bigfoot looked like a bear, yet to go on to rule out that identification. For example, a woman in Washington state in 1933 at first "thought it was a bear on the porch, but this animal was standing on its back legs [!] and was so large it was bending over to look in the window." In the moonlight, she decided it "looked like an ape" (Bord and Bord 2006, 31–33; Nickell 2013a).

Florida Skunk Ape. Also known as the Swamp Ape and other appellations, this is a huge, furry, smelly man-beast that inhabits Florida's forests and swamps. I assembled two groups of reports (Bord and Bord 2006, 213–210, and Jenkins 2010, 77–128) for a total of seventy-seven case studies. These show that—on average—the alleged creature is black or "dark," stands upright at 7.45 feet tall, and weighs 508.3 pounds. It is said to be distinctively "smelly" (but actually seems little more so in that regard than Bigfoot in general). Its signs include large tracks and uprooted plants. As it happens, Bigfoot is quite similar in these and other respects to a black bear (*Ursus americanus*), especially when standing upright (as in the "alert" mode or when attempting to peer in a window). For example, in 1957 a man, hunting wild boar in the Everglades late one afternoon, encountered "What looked like a bear squatting," but then "the thing slowly stood up to a staggering height of about eight feet." In the dark thicket, he saw it had yellow-orange eyeshine "like the eyes of a large animal" (Jenkins 2010, 89–90). In many such cases, a black bear seems a likely candidate for the sighting (Nickell 2013b).

Among the alien beings that allegedly visited our planet in the 1950s and 1960s were such fanciful creatures as the "Flatwoods Monster," some "Little Green Men," and the iconic "Mothman."

Extraterrestrials

Among the alien beings that allegedly visited our planet in the 1950s and 1960s were such fanciful creatures as the "Flatwoods Monster," some "Little Green Men," and the iconic "Mothman." Each is discussed here in turn.

Flatwoods Monster. West Virginia's legendary monster of 1952, supposedly transported by a UFO (which turned out to have been a meteor) was described by frightened eyewitnesses as having a somewhat "manlike shape," a "round," "fiery orange" face surrounded by a "hoodlike shape," and "shining," "animal eyes." In addition, it exhibited "terrible claws" and moved with "a gliding motion as if afloat in mid air." Its cry was "something between a hiss and a high-pitched squeal" (Barker 1953, 1956; Sanderson 1967). They described, in other words, quite accurately, a barn owl, except they said it was ten feet tall. Apparently, when first encountered, it was perched on a limb (Nickell 2011a, 159–66).

"Little Green Men." The appellation is inaccurate, largely due to the whimsy of the news media. But a Kelly, Kentucky, farm family did claim to have been terrorized by strange, small creatures on the night of August 21, 1955—events foreshadowed by the appearance of a fiery "flying saucer" early in the evening. Then, over a three-hour span, a scary face appeared at a window, provoking gunfire from two men inside, and when they went out into the night, one's hair was grabbed by a claw-like hand. Once, the excited pair shot at a little creature on the roof and at another "in a nearby tree" that then "floated" to the ground. A half century later, I visited the area, speaking with witnesses to the event, and obtaining original newspaper accounts. The creatures were varyingly described, but each appeared to be "two and a half feet tall," with a large head, big pointed ears, claw-like hands (with talons), and eyes that shone yellow. Although some have branded the affair a hoax, I determined that the culprits were likely a pair of territorial great horned owls (*Bubo virginianus*). Such owls have a height of some twenty-five inches and were no doubt misperceived in the dark and excitement. (UFOlogist Thomas

Bullard [2010, 57] has suggested such an attack "seems unprecedented," but *Birds of North America* (Alsop 2001, 371), states that the great horned owl "Often aggressively defends nest and young to the point of striking humans who venture too close.") As to the fiery UFO, there were meteor sightings that preceded the encounter (Nickell 2011a, 167–173).

Mothman. Again, another West Virginia monster, the famous "Mothman" of 1966, was described in some detail by those who first encountered it. It was a winged creature, walking on the ground with a shuffling gait. One witness stated that it was "shaped like a man, but bigger." It was described as seemingly headless but with great eyes, shining red "like automobile reflectors," set near the top of its body. When it took flight it seemed to follow witnesses, although without "even flapping wings." This monster seemed an accurate description of a barred owl with its crimson eyeshine, except, again, for its great size. But which is more likely, that there is a hitherto unknown monster, or that encountering a frightening creature at night prompts some to misjudge its size—after first misjudging the intervening distance? The area in which Mothman was first seen was a wildlife sanctuary containing barred owls! (Nickell 2011a, 175–81).

Supernaturals

So far we have looked at those paranormal or paranatural entities that could theoretically be part of our natural world—that is, if they actually exist at all. Here we consider the alleged supernatural realm—one supposedly outside, and so, antithetical, to nature and thus to science. Examples are the ancient werewolf and the modern chupacabra.

Werewolves in Austria. On an investigative tour of Europe in mid-2004, German skeptic Martin Mahner and I visited Moosham Castle in Austria where in 1717 two adolescent beggars confessed they were responsible for an unusual number of cattle and deer killings in the area. We stood in the very horror chamber where, under torture, they admitted having received a black unguent from the devil capable of transforming them immediately into wolves. However, neither the existence of the ointment nor its effect was ever demonstrated. The two escaped execution but were sentenced to lifelong service as galley slaves on Venetian ships, which amounted to a slow but inevitable death. In retrospect, it seems that it was only when attempts to hunt and kill the actual predators failed, that superstitious folk concluded the creature must have been supernatural. Most likely, the actual culprits prevalent in the Moosham district at the time were ordinary wolves (*Canis lupus*) (Nickell 2011a, 101–107).

Chupacabra. This fabled vampiric creature has reportedly preyed on farm animals in many countries since it first appeared in Puerto Rico in 1995. I wrote one of the early skeptical pieces on the "goatsucker" (as its Spanish name translates to) after the scare spread to Mexico in April 1996. I was assisted by colleagues in Mexico, Patricia and Mario Mendez-Acosta. As it happened, when authorities staked out farmyards, wild dogs were caught each time. Although the goats, turkeys, horses, and other animals killed by the chupacabra were invariably claimed to have been drained of blood, the reverse was true; necropsies consistently showed that gravity had simply caused the blood to settle (drain downward) in the carcasses. In 2011, an animal some speculated was a chupacabra made repeated attacks on the farm of Tim Stoll in Missouri, costing the family a chicken a day. On November 5, it returned—spooking their horses and heading for the goat pen—a strange, largely hairless, yellow-eyed creature. Stoll's teenage stepson, Dalton, felled the animal with a single shot from a deer rifle. I was able to visit the farm shortly thereafter and was hospitably received. (Dalton even recognized me from my appearances on *Monster Quest*.) The animal was clearly from the family *canidae* (dogs, wolves, coyotes, and foxes), and suffering from mange. I took photos and later compared its coloring, dentition, and other features, including its yellow eyes, with other canids, reaching the definite conclusion that it was a coyote (*Canis latrans*)—as close to a chupacabra, apparently, as we yet have (Nickell 2011a, 141–46; 2011b).

* * * *

As shown by the foregoing examples—some fourteen in all—sightings of what are described as paranatural creatures may actually be the result of lookalikes—animals from the real, natural world—that are misperceived, due to darkness, distance, fear, expectation, or other factors. ■

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Sheaffer's "Psychic Vibrations" column has appeared in the SKEPTICAL INQUIRER for nearly forty years; its highlights have now been published as a book (Create Space, 2011). Sheaffer blogs at www.BadUFOs.com, and his website is www.debunker.com.

Were Half of Recently Declassified UFO Reports CIA Flights?

Around January 20, 2015, news reports in many major news outlets carried headlines like "Air Force UFO Files Hit the Web," "U.S. Air Force Releases Thousands of Pages of Declassified UFO Files," and "Two Decades of Mysterious Air Force UFO Files Now Available Online." The only problem was that anyone with even minimal knowledge of current UFOlogy knows that the files of the U.S. Air Force's Project Blue Book have been online for years (and available on microfilm for decades). Roswell proponent Kevin Randle, who has been in UFOlogy a very long time, quickly added some perspective (http://goo.gl/CkBerf):

> They're referring to John Green[e]wald's efforts to post all of these files at his Black Vault website, and his effort is commendable. But NICAP had many of the files online for years and I have never found a gap in the Fold 3's Blue Book files also on line. Or, in other words, the only "news" here is that John has provided us with another site where we can see these files.
>
> ABC also seemed to suggest that this was something new: The Air Force had finally released all of the files of its investigation, except, of course, they did that in 1976. I made a trip down to Maxwell Air Force Base and spent time going through the files. Anyone could have done it but the fact the files had been declassified hadn't been announced publically. There had been some sort of announcement in an Air Force bulletin that I happened to see, so I made arrangements to take a look.
>
> And once those files were transferred to the National Archives in Washington, D.C., they were more accessible to the public. You could buy the microfilm copies for something like eight or ten dollars a roll back then, but there were ninety some rolls of them. Over the years I actually managed to obtain a full set of the microfilms, so I've had all of the Blue Book files in my office for a couple of decades.

One Saturday in 1976, immediately after Project Blue Book microfilms were released to the National Archives, I went down to the Archives in Washington, D.C., with the late Philip J. Klass, the dean of UFO skeptics. We spent a day looking over those records. We were both surprised at the relatively poor readability of the records and their generally uninteresting content.

But all was not well in the online land of Blue Book. Accusations quickly surfaced that Greenewald had simply copied the files from another site and posted them as his own. Apparently a user on Abovetopsecret.com was mass-downloading the Blue Book files from fold3.com, and Greenewald offered a place for them to be stored. He was soon backpedaling (http://goo.gl/c1BnJf):

> I gave credit to the investigator who compiled the 130,000 jpeg images, which he then started circulating for someone to figure out how to convert them to a better format about 8 months ago. For a couple months, no one did anything with them (but circulated a torrent file), and although I offered to help store the files on the web, I felt I wasn't smart enough to convert them to something that was web-friendly. After about 3 months, and I noticed no one cared or was able to take the project to the next level, with the full knowledge of the one who compiled the data, I built the entire database. Converted 130,000 jpeg images (which are just about as useless as microfilm, but at least they were digitized) to a user friendly format.

It was soon being reported, "New Air Force UFO Files Site is Mysteriously 'Unavailable,'" giving rise to certain conspiracy claims. Finally, Greenewald explained everything and threw in the towel (http://projectbluebook.theblackvault.com/):

> January 29th, 2015—It is with great frustration to announce, that Ancestry.com, and their subsidiary Fold3, has laid down a claim to copyright on the Project Blue Book material—which has long been labeled as "public domain" by the National Archives & Records Administration (NARA). Ancestry.com is claiming ownership to the digital version of this material—despite me having records that Fold3 doesn't even have in their archive and I received under the FOIA starting back in 1996. They simply claimed it was 100% theirs and I was forced to remove it.

The Blue Book files have been available online since 2005 at http://www.bluebookarchive.org/, and at http://tinyurl.com/fold3bbk since 2007.

Randle closes with this observation: "I will note that Jack Webb, in preparation for his TV series about Project Blue Book paid to have all the files microfilmed. We all owe him thanks for doing that."

In Greenewald's defense, he says "First off, I never, EVER, made it appear these documents were newly declassified. The media created that, and many outlets copied each other." He also notes that the Blue Book files on his site were in a format that made them easier to search and to download. But the real hero of this story would seem to be not Greenewald but Jack Webb. Just the facts, ma'am. Just the facts.

* * *

So now that we have the online Blue Book files at our fingertips, what do they contain? Once again, the claim has resurfaced that during the 1950s and 1960s high-altitude CIA manned reconnaissance flights involving the U-2 and the later SR-71 were responsible for half of all UFO sightings. The CIA's year-end Twitter review noted that the most popular CIA tweet of 2014 (yes, you can become a Twitter follower of @CIA) was: "Reports of unusual activity in the skies in the 50s? It was us."

This claim is now (once again) all over the Internet, and the news media treated it in their usual uncritical manner. "CIA Admits: All Those UFO sightings in 1950s? 'It Was Us.'"; "CIA: All Those 1950s UFO Sightings? 'It Was Us.'"

One thing this CIA claim about UFOs has accomplished is uniting skeptics and UFO proponents in proclaiming it untrue. We might agree on little else, except that this claim is nonsense.

The CIA/UFO claim first surfaced in an intelligence-related article by historian Gerald K. Haines published in 1997 (http://goo.gl/FpKB7Z). The current claim references a report issued by the CIA, *The CIA and the U2 Program, 1954-1974* (http://goo.gl/O7JsaE). The once-secret document was written back in 1998. In it (on PDF, not document, pages 84–85),

> High-altitude testing of the U2 soon led to an unexpected side effect — a tremendous increase in reports of unidentified flying objects. In the mid-1950s, most commercial airliners flew at altitudes between 10,000 and 20,000 feet and military aircraft like the B47s and B57s operated at altitudes below 40,000 feet. Consequently, once U-2s started flying at altitudes above 60,000 feet, air-traffic controllers began receiving increasing numbers of UFO reports.

Can that claim be substantiated? Nope.

> Not only did the airline pilots report their sightings to air-traffic controllers, but they and ground-based observers also wrote letters to the Air Force unit at Wright Air Development Command in Dayton charged with investigating such phenomena. This, in turn, led to the Air Force's Operation BLUE BOOK. Based at Wright-Patterson, the operation collected all reports of UFO sightings. Air Force investigators then attempted to explain such sightings by linking them to natural phenomena. BLUE BOOK investigators regularly called on the Agency's Project Staff in Washington to check reported UFO sightings against U-2 flight logs. This enabled the investigators to eliminate the majority of the UFO reports, although they could not reveal to the letter writers the true cause of the UFO sightings. U-2 and later OXCART flights accounted for more than one-half of all UFO reports during the 1950s and 1960s.

Mark Rodeghier of CUFOS contacted Lt. Col. (Ret.) Robert Friend, who was the head of Blue Book from about 1958 to early 1963. If anyone should know about this, it is him. "Absolutely not true," he said (http://goo.gl/5Tt1ya). Friend "found the whole idea laughable, and he knew Blue Book did not receive more reports from pilots and air traffic controllers after the U-2 began flying."

So now that we have the online Blue Book files at our fingertips, what do they contain? Once again, the claim has resurfaced that during the 1950s and 1960s high-altitude CIA manned reconnaissance flights involving the U-2 and the later SR-71 were responsible for half of all UFO sightings.

It may be that a few UFO reports were caused by U-2 flights, but when Friend was asked by Rodeghier if he could recall even a single such case, he said, to his recollection, no. (Frankly, I can't think of one either.) "Once again, he chuckled about the idea of half of all UFO reports being caused by manned reconnaissance flights."

UFO photo analyst Bruce Maccabee says simply that the "CIA's UFO Explanation Is Preposterous" (http://goo.gl/D3vQoz): "The U-2, with its 80 ft long by 6 ft wide (front to back) wingspan flew at 60-70,000 feet and at that altitude was essentially invisible during the day. It created no contrail because of the lack of moisture at that altitude. It was, after all, intended to be invisible."

Maccabee is right about this. Now that the Blue Book files are readily available, anyone can verify when and

where sightings were reported. Maccabee demonstrates that sightings did not increase after the U-2 started flying. The bottom line is: there is absolutely no correlation between the times and places of UFO reports and U-2 flights.

Back in August of 2013, Alejandro Rojas of Open Minds pointed out another problem in the CIA's claim about the U-2 flights, which began in 1954. It says witnesses began to write letters to the Air Force, and "This, in turn, led to the Air Force's Operation Blue Book" (http://goo.gl/UVZsuX):

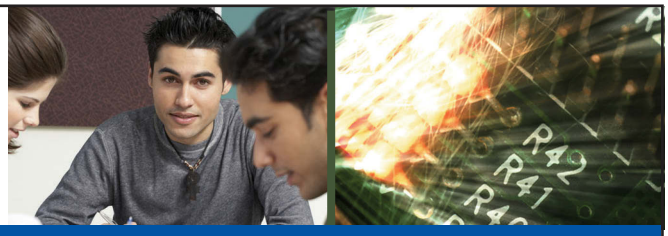
> Project Blue Book was an official U.S. Air Force investigation of UFOs established in 1951, and was actually the third Air Force project to investigate UFO sightings. The first was Project Sign, set up in 1948, which then became Project Grudge in 1949, and finally Blue Book in 1951.

Why did the CIA make such an absurd claim? It's hard to say.

The CIA's claim that the U-2 flights led to the creation of Project Blue Book is impossible, because Blue Book predates the U-2 flights by several years. Why did the CIA make such an absurd claim? It's hard to say. Some see in this a sinister attempt at disinformation. I don't think that's the case, because if the CIA wanted to issue disinformation, it would have come up with a story that is not so transparently bogus as this. The footnote accompanying the "one-half" claim simply reads: "Information supplied by James Cunningham to [co-author] Donald E. Welzenbach." Who is James Cunningham? Under "Key Personnel" in Appendix B, we find: "James Cunningham, Jr. An ex-Marine Corps pilot, he became the administrative officer for the U-2 in April 1955. Cunningham handled the day-to-day management of the U-2 program and brought only the more complex problems to Richard Bissell's attention. Later he served as the Deputy Director of the Office of Special Activities and then Special Assistant to the Deputy Director for Science and Technology." In other words, a bureaucrat in the U-2 program.

The world of UFOlogy is filled with those who exaggerate (if not fabricate) events to make themselves seem important. The authors of the CIA report seem to have immortalized a groundless boast by a program bureaucrat and turned it into one of those "facts" that practically everyone has heard—and practically everyone believes—but has no foundation in truth. ■

SCIENCE AND THE PUBLIC



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[NOTES ON A STRANGE WORLD MASSIMO POLIDORO

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Enter the Boy Wonder, Part 2

Randi vs. Geller: How the Giant Battle Began

As announced in a previous column, I will be writing James Randi's biography. We are going to start a fundraising campaign shortly. If you want to support the project or just receive news and updates, you can go to www.theamazingrandistory.com and subscribe to our newsletter. Meanwhile, here is the second part of a sample from the book that I hope you will enjoy.

In the previous episode, James Randi was invited under cover, on February 6, 1973, to attend self-proclaimed psychic Uri Geller's first appereance in front of a team of journalists at Time *magazine's headquarters in New York. Randi, posing as a journalist, along with his friend, photographer Charles Reynolds, observed Geller perform his feats and was very little impressed. When Geller starts to demonstrate how he can "telepathically" guess hidden drawings, Randi decides to have a try…*

Uri Geller explained how in the laboratories at Stanford Research Institute (SRI) he would do all kinds of experiments while he was locked in a Faraday cage, a shielded room, while the scientists were ten miles away. "It blows their mind when I get the drawing!"

He then tried the drawing experiment with the girl sitting next to him and, again, he was successful. Things seemed to be on a roll. Some of the younger members of the group seemed to share the enthusiasm of the young psychic, but the older ones clearly did not.

"Can I try?" asked Randi, perched on the couch behind Geller.

"Sure . . . Again, try to draw a very simple shape."

"All right," said Randi, waiting for Geller to cover his eyes. He drew some wavy lines on the page, ensuring the tip of his pen could not be seen from Geller's vantage point.

Geller sighed and proceeded to draw a square, a little star, and a triangle. "This is getting a little bit tiring . . . I am not sure I can keep up . . ."

When Randi turned around his pad, Geller shrugged.

"See? It doesn't always work, and this just shows that it's not a trick."

Leon Jaroff couldn't contain himself. "He is peeking!"

Geller, acting as if he hadn't heard, suggested a change of procedure. "Why don't I try to project my thoughts into somebody else's mind?"

He wrote something on his pad and then turned it upside down.

"Alright, I will try to project the name of a foreign capital. But not Tel Aviv, for that would be too easy!"

The crowd giggled cooperatively.

"You," asked Geller to a man standing beside Randi. "What city did you receive?"

"London," the man replied.

"Look!" exclaimed Geller, turning up his pad. He had written both Paris and London, but had crossed out lightly the second one.

"Damn my luck! I should have stayed with my first impulse."

"I got Paris!" announced a young staffer in the back.

"Very good," said Geller, uplifted. "You seem to be in tune with me. Pick a digit between 1 and 10."

"Seven."

"Yes!" shouted Uri, showing a scrawled "7" on his pad.

Again, Randi and Charlie Reynolds exchanged glances and suppressed smiles.

They both had previously discussed a letter sent by Ray Hyman to Martin Gardner describing the psychologist's observations of Geller in California, when he presented exactly the same routine, using the same cities and same numbers—a very old set-up of mind-readers, relying on commonplace facts.

Possibly sensing his audience was becoming increasingly skeptical, Geller stood up and approached a wall where a cuckoo clock was hanging. He took it off the wall and put it on the coffee table in front of the couch, explaining how sometimes he was able to fix broken watches and even move the hands of working ones without touching them.

Randi moved closer to get a better vantage point.

Geller closed his eyes and moved his fists on top of the clock.

"I just say 'move', in my mind. Move, move . . ."

But nothing seemed to move.

"No, I don't feel for that," he announced stopping abruptly. "Maybe we'll try it later. Why don't we attempt some metal bending?"

He sat again on the couch and asked for two utensils. They had to be similar in order to compare them and see if one was beginning to bend.

While a staffer brought two forks, Randi resumed his position behind the young psychic's back, but Geller suddenly turned around. Randi quickly pretended to scribble some notes on his pad.

"I am sorry; I didn't get your role here today . . ."

"Oh, I am just taking notes," replied Randi-as-"Mr. Zwinge" casually, and went on scribbling some more.

Apparently satisfied by the answer, Geller turned around and asked the staffer to hold the two forks by the tip.

"I won't put on any pressure; I just stroke them gently and you tell me if you feel anything."

She said she felt some tingling, but the forks were compared and they hadn't bent. This was repeated a few times to no avail for about twenty minutes.

"Would you hold them?" Geller handed them to Randi.

Randi took the forks between his hands.

"Do you feel anything?"

"No."

The forks were again compared. Still no bend.

Jaroff, looking very grumpy, kept on checking his watch.

Very frustrated, Geller took one fork and gave it to the girl sitting next to him. "We'll try it another way. Now, everyone concentrate on the fork she is holding. Come on . . . look, it's bending now!"

As he exhorted the group, he casually moved to put the other fork down on the coffee table. Everyone else was looking at the fork held by the staff member—which didn't appear to be bending at all, despite Geller's assertion—but Randi and Charlie never took their eyes off the one in Geller's hands. What they saw next confirmed all their suspicions: just prior to setting it down, Geller quickly bent the fork upward with both hands. He then dropped it on the table and shuffled the papers there in order to cover the bend. It was an elegant magician's misdirection.

In fact, later when the fork in the staffer's hand was taken, it was dropped on the table, the papers were shuffled around in order to find the other fork, and the confusion was such that nobody knew which one had been held by the girl. When comparing the two, however, one was miraculously bent.

The psychic, who thought he was unobserved, placed the tip of the key against the top of the table and, leaning forward, used his body weight to help bend it. Randi raised his eyes and met those of Charlie. *We got him!*

Johnny will like this, thought Randi, who was scheduled to appear on *The Tonight Show* in a few weeks.

"You know, sometimes the metal keeps bending for a while, even after I leave," explained Geller. "It works better with keys. Do you have one?"

Charlie took out of his pocket the key to the *Popular Photography* picture room and handed it to him.

Geller took the key and started describing what he was doing, stroking the key, very gently. "I think 'bend!' and I talk to the key. And hopefully something will happen."

Jaroff shook his head, clearly ready to leave any second.

Geller tried several times and asked various people to hold the key in their fist, but it didn't seem to bend at all.

"Maybe we could try with something else," suggested Geller, suddenly uninterested in the key.

"A spoon?" suggested a secretary.

"No, we need something stronger."

"How about a beer can opener?" volunteered the fellow who had been "in tune" with Geller earlier.

"Yeah, that's a good idea. Let's do that."

There was some rummaging around in order to find the can opener, but Randi and Charlie did not participate. Randi kept scribbling, in order to convince Geller that he was writing, but in reality he was keeping his eyes fixed on the key in Uri's hands.

The psychic, who thought he was unobserved, placed the tip of the key against the top of the table and, leaning forward, used his body weight to help bend it. Randi raised his eyes and met those of Charlie. *We got him!*

After a few minutes of fruitless searching for the opener, Geller produced the key, hiding the bent part, and placed it in someone's hands.

"Hold tight. This is my last shot," he said. "If it doesn't work, I will stop."

Again, he said that he was thinking "bend" and asked that everybody think the same word. He explained that if the audience was with him, if the members gave him their mental energies, usually things would work out beautifully.

He said "bend" a couple of times and then, as if disillusioned, told the person to open his hand.

When the bend in the key was revealed, Geller almost jumped from the couch. "We did it! This is fantastic!"

He stood up and rushed into the next office to show it to someone else, and when he returned Randi noticed the key was bent even further.

In his excitement, Geller showed the key to everyone in the room. When he was finally in front of "Mr. Zwinge," the boy wonder asked, "Did you see it?"

Randi, almost glowing like the Cheshire cat, looked him straight in the eyes.

"Oh yes, I certainly did."

As soon as Geller left, Dr. Andrija Puharich, who Randi had before encountered, rushed into the meeting room and went straight to Randi, who was by his coat turning off the tape recorder.

"There you are!" he shouted, pointing his finger at him. "You are the Amazing Randi!"

Randi turned around to look dryly at him. "*Oui, c'est moi.*"

"Ah!" Puharich exclaimed loudly. "So you confess it, you are the Amazing Randi, the magician. I was told by a secretary that you were here as soon as I left, and I was fuming at the thought of the lynching party that you had planned in here."

"Lynching party?"

"Oh yes, I know all about you. And you, Mr. Reynolds, you didn't say you were a magician too! So, did you enjoy trying to catch Uri?"

Randi laughed. "There was no trying, Doctor. I *did* catch him."

When Puharich finally left, Randi showed everybody else what had actually taken place that morning. He explained how the telepathy test had been possible, through peeking and "pencil reading," and why he had asked the girl next to him to cover her eyes as well, in order to avoid being seen peeking. Randi also showed how the fork and key had been secretly bent in advance to be later revealed.

Attempts by Puharich to squash the story, by having the president of Stanford University call Ralph Davidson, the publisher of *Time*, in order to convince him that Geller was genuine, did not have the desired effect. When *Time* subsequently had problems with the machinery of their computerized copy-processing system, Davidson, in an editorial of a cover story of an issue devoted to "The Psychics," jokingly referred to them as "due to some bizarre and mysterious force." A force which, naturally, Geller later claimed had been produced by none other than himself.

"A few days before the magazine was due to appear," wrote Geller many years later in his book *The Geller Effect*,[1] "I went out on the balcony of my apartment on 57th Street, looking in the direction of the Time-Life building at the Rockefeller Center, and began to concentrate as hard as I could. . . . I simply formed a strong 'blocking' thought in my mind, repeating the words 'Don't let it happen' and visualizing the pages of the magazine rolling off the press with just my name replacing all the copy—column after column of *Uri Geller Uri Geller Uri Geller*."

Perhaps his powers were not with him that day. Though the name Uri Geller did appear in the magazine (the computer problems were actually resolved before the issue went to print) the article drew a less than flattering portrait. Titled "The Magician and the Think Tank,"[2] it called Geller "a questionable nightclub magician" and quoted Ray Hyman's comments about the SRI tests, described as "the most uncontrolled and poorly recorded data I have ever encountered" and performed with "incredible sloppiness."[3] Further, it revealed that Geller had come under suspicion in his own Israel when a group of psychologists and computer experts from Hebrew University duplicated his feats and called him a fraud.[4]

Randi showed everybody else what had actually taken place that morning. He explained how the telepathy test had been possible, through peeking and "pencil reading," and why he had asked the girl next to him to cover her eyes as well, in order to avoid being seen peeking.

Alas, as all celebrities know, "any publicity is good publicity." Far from destroying his credibility, the *Time* article helped push Uri's name in the limelight. The "boy wonder" would continue to get bookings—and build his reputation as a psychic—in the United States and around the world.

But Randi was now ready, and he knew exactly what he was dealing with. Geller was a fine performer, whose demeanor, mechanical skills, and psychological handling of some difficult moments evoked great admiration on Randi's part. He could not deny that he saw in Geller much of the same genius that was the glory of such men as dear old Joe Dunninger, the king of mindreaders.

However, it was one thing to leave an audience befuddled and amazed. It was another to almost literally swindle trusting souls. Randi could not countenance this kind of callous behavior and swore to himself that he would fight against all this.[5]

A battle of wits, and giant egos, was just beginning. ■

Notes

1. Uri Geller, *The Geller Effect*, Jonathan Cape, London, 1986, p. 136.

2. "The Magician and the Think Tank," *Time*, March 12, 1973, 110–112.

3. Hyman's quotes came from the letter he wrote to Martin Gardner and, even though it was not supposed to become public, Jaroff had got ahold of it. "I tried to argue with them that my letter was supposed to be privileged information," said Ray Hyman. "They finally gave me a choice: either I could let them quote directly from my letter, or they would paraphrase the contents. I hastily decided to let them quote directly in the wrong belief that this would preclude their distorting what I had written. This turned out to be a mistake. When I was speaking with *Time* magazine, I tried to recall what I had written to Martin. Although the letter was thirteen pages long, I felt sure that I had stuck to the facts and had not said anything that could get me into trouble. I was wrong. To put it mildly, Targ and Puthoff were livid. My folder contains an exchange of correspondence between Charles Anderson, the President of Stanford Research Institute, and myself. The exchange began with a letter to me from Anderson asking whether the quotations attributed to me were accurate. He emphasized that SRI is a research company that depends upon its stellar reputation in research for millions of dollars annually in contracts. My disparaging remarks about SRI's quality of research could result in their losing millions of dollars. He implied that SRI was going to sue me. I responded by providing him more detailed descriptions of what I had witnessed at SRI and made clear that my disparaging remarks were clearly restricted to the research done on Geller and were not aimed at all the other research done at SRI. I told him that I had made detailed notes to back up my judgment about the incompetence of the investigation of Geller. After a few such exchanges, especially after one in which I threatened to reveal even more of what I had observed, Anderson dropped the correspondence. And, fortunately, did not drag me into court."

4. The episode is described in: "Telepathist Geller Termed a Fraud," *Jerusalem Post*, October 5, 1970.

5. Randi's reasoning appears in these same words in a letter he sent to Uri Geller on May 9, 1975.

Steven Novella, MD, is assistant professor of neurology at Yale School of Medicine, the host of the *Skeptics' Guide to the Universe* podcast, author of the *NeuroLogica* blog, executive editor of the *Science-Based Medicine* blog, and president of the New England Skeptical Society.

It's Time for Science-Based Medicine

In the pages of the Skeptical Inquirer and elsewhere in the skeptical literature, you can read about a seemingly endless array of snake oil remedies, dubious health claims, questionable practices, ineffective regulation, and shortcomings of mainstream medicine. All of this is happening in an era of so-called "evidence-based medicine," which was supposed to rededicate the medical profession to a solid scientific grounding in order to bring the best possible care to each patient.

Don't get me wrong: modern medicine is a science-based endeavor. We continue to make tremendous, even accelerating, progress in understanding and treating disease. The institutions of science and the professionalism within medicine are also improving over time. The evidence-based medicine (EBM) movement has been, overall, a positive influence on the practice of medicine. EBM had two main goals: to evaluate and systematically characterize the evidence base for each clinical decision, and to deliver this information to practitioners when and where they need it. EBM is great as far as it goes, but it has some interesting flaws, and clearly has not done enough to eradicate pseudoscience and substandard practice from medicine.

That is exactly why I founded the website Science-Based Medicine, which has recently spawned the Society for Science-Based Medicine group (headed by Mark Crislip).

The goal of science-based medicine (SBM) is to raise the practice of medicine to the highest standards possible, relying on the full spectrum of scientific evidence; raising the application of critical thinking to the practice of medicine; optimizing the institutions of science, research, and academia; rooting out pseudoscience and quackery; and advocating for effective regulations.

Science-Based Medicine vs. Evidence-Based Medicine

The core weakness of evidence-based medicine is that it relies, as the name implies, solely on clinical evidence to determine whether a treatment is appropriate or not. This may superficially sound reasonable, but it deliberately leaves out an important part of the scientific evidence: plausibility.

When EBM was first proposed, the idea was that doctors should not be using treatments simply because they make sense. We need evidence to show that the treatments are actually safe and effective. This is reasonable, but their solution was to eliminate "making sense" (or plausibility) from the equation. Each treatment was considered conceptually as a blank slate or with a level playing field—the only thing that mattered was the clinical evidence.

Unfortunately, the EBM movement came at roughly the same time that dubious health practices were being rebranded as "complementary and alternative medicine" (CAM). By leveling the playing field, EBM inadvertently removed the primary objection to most CAM modalities: that they are highly implausible. I guess it did not occur to early EBM proponents that anyone would seriously propose a highly implausible treatment and try to study it scientifically. CAM proponents fell in love with EBM, because it gave them the opportunity to present their treatments with a veneer of scientific legitimacy. They tend to interpret EBM as meaning that if you can point to any evidence whatsoever (no matter how poor and conflicting), then you can call your practice "evidence-based."

One of the standard bearers for EBM is the Cochrane Collaboration, which publishes high-quality systematic reviews of clinical questions. Cochrane reviews quickly became ripe for CAM exploitation. My favorite example is a Cochrane review of homeopathic substance Oscillococcinum for the flu (Vickers and Smith 2009). Oscillococcinum is imaginary, and homeopathy is utter nonsense, so this treatment is akin to fairy dust diluted out of existence. If anything should be treated as having a prior plausibility of zero, this is it. Yet the authors concluded:

> Though promising, the data were not strong enough to make a general recommendation to use Oscillococcinum for first-line treatment of influenza and influenza-like syndromes. Further research is warranted but the required sample sizes are large. Current evidence does not support a preventative effect of Oscillococcinum-like homeopathic medicines in influenza and influenza-like syndromes. (Vickers and Smith 2009)

While they are essentially saying that the evidence is negative, they characterize the treatment as "promising" and recommend "further research." SBM would take a different approach.

A science-based medicine review would explicitly consider prior scientific plausibility, bringing to bear our understanding of physics, chemistry, and biology, which represent a far larger and more reliable body of scientific evidence than the few clinical studies of Oscillococcinum. It would also consider the totality of homeopathy research in the context of our current understanding of patterns of evidence in the medical literature.

An SBM review would conclude that the scientific basis for the existence of Oscillococcinum is unconvincing to say the least, and actually is rank pseudoscience analogous with N-rays. Homeopathy itself also qualifies as pseudoscience, because it is at odds with our basic understanding of physics and chemistry. Furthermore, the totality of the homeopathy clinical research is most consistent with a treatment that has no effect.

We therefore have an ineffective application of a nonexistent substance. Further, there is no scientific reason to presume that this particularly treatment will be effective for the flu. Finally, the clinical evidence is insufficient (unsurprisingly) to conclude that the treatment works. Taken as a whole it seems that this treatment has no promise and any further research would be such a waste of resources as to be unethical.

Prior Plausibility

It is not surprising that advocates of dubious health treatments do not like the concept of plausibility. They have been basking in the sun of EBM where they don't have to answer for extreme scientific implausibility and resent SBM trying to ruin their good time.

This attitude is represented by an opinion piece by David Katz, in which he writes:

> This essay makes the case that such borders are not readily defined and challenges policy makers and practitioners with this question: In which direction lies the greater risk of miscarriage for legitimate scientific inquiry and the promise of improving the human condition—in the belief that something works whether or not it's plausible, or in the conviction that something is implausible whether or not it works? (Katz 2010)

It is not surprising that advocates of dubious health treatments do not like the concept of plausibility. They have been basking in the sun of evidence-based medicine where they don't have to answer for extreme scientific implausibility.

Katz and other CAM advocates try to present plausibility as a mere bias, one that will turn us away from effective treatment. Katz completely misses the point—plausibility is partly how we know *if* something works. CAM advocates tend to start with the conviction that their treatments work, and are trying to find scientific justification to help them market their treatment. I have yet to find a single example of a CAM modality that was abandoned by its advocates due to evidence of lack of efficacy.

SBM recognizes that clinical evidence is tricky, complicated, and often ambiguous. There is good evidence to support this position. John Ioannidis has published a series of papers looking at patterns in the clinical research. He found that most published studies actually come to what is ultimately the wrong conclusion, with a strong false-positive bias (Ioannidis 2005). This effect is worsened in proportion to the implausibility of the clinical question.

Simmons et al. nicely demonstrated that by exploiting common researcher "degrees of freedom," that almost any set of data can be made to seem statistically significant (Simmons et al. 2011). In other words, it is possible to manipulate the data, even completely innocently, just by making decisions about how to collect and analyze the data that can achieve a falsely statistically significant result. Individual studies, therefore, should rarely be compelling. Data is only truly reliable when it is independently replicated, especially in a way that eliminates the degrees of freedom.

In a commentary for *Nature*, Regina Nuzzo describes what is called "p-hacking," which is essentially what Simmons et al. were also describing (Nuzzo 2014). Nuzzo is specifically criticizing over-reliance on P-values, which is the statistical measure of whether or not data is significant and should be taken seriously. P-values, however, are not as reliable as many assume.

A P-value of 0.01, which many falsely believe to mean that the effect being studied has a 99 percent chance of being real, only has a 50 percent chance of being replicated with fresh data. So even a value that many take as solid evidence is really only a coin flip when you properly understand the statistics. The problem of over-reliance on P-values is further demonstrated by statistician Geof Cummings in a video he posted on YouTube (Cummings 2009).

One solution to the weaknesses of P-values is to supplement or even replace this type of statistical analysis with another type of analysis called Bayesian analysis. Bayesian analysis formally considers prior plausibility. It looks at the data as common sense dictates: How much does this new data affect the prior probability that a specific scientific idea is true?

Conclusion

The core philosophy of SBM is to use the best possible conclusion that science currently has to offer in making clinical decisions (including regulatory ones). This includes the most rigorous clinical studies possible. However, it must also consider preclinical and basic science—all scientific information that can reasonably be applied to the question at hand. This means considering the overall scientific plausibility of any clinical claim.

Clinical evidence faces many challenges, including researcher bias, publication bias, and the vagaries of statistical analysis. Most studies that are performed are imperfect; for example they may be too small, may not sufficiently account for all variables, may have defects in blinding, and have to make many choices (such as which outcomes to measure and compare), that can affect the outcome. (For more discussion on these points, see Morton E. Tavel, "Bias in Reporting of Medical Research," in this issue, p. 34.)

It often takes decades for clinical research to progress to the point that we have highly rigorous and definitive trials. In the meantime, we have to make decisions based upon imperfect evidence. Basic science plausibility helps put the clinical evidence into context, improving our ability to make reliable decisions based upon preliminary clinical data. That is why I believe that evidence-based medicine should evolve in the direction of science-based medicine. That would be the evidence-based thing to do. ■

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[SCIENCE WATCH KENNETH W. KRAUSE

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Diet-Heart: A Hypothesis in Crisis? Part 2: The Modern Macronutrient Wars Begin

In her now-classic book *Food Politics*, Marion Nestle—New York University professor of nutrition and former nutrition science adviser to the U.S. Department of Health and Human Services, Department of Agriculture, and Food and Drug Administration—affirmed that "scientists consistently have demonstrated the health benefits of diets rich in fruits and vegetables [and] limited in foods and fats of animal origin" (Nestle 2013). She continued:

> Decades ago, researchers discovered that high levels of cholesterol in the blood predispose individuals to coronary heart disease and that saturated fat (most prominent in meat and dairy products) raises blood cholesterol more than monounsaturated fats (typical of olive oil). They also observed that polyunsaturated fats (most prominent in vegetable seed oils) reduce blood cholesterol levels.

In fact, by the time *Food Politics* was first published in 2002, every major health organization, including the National Academy of Sciences, had agreed that saturated fatty acids raise the risk of cardiovascular disease, including coronary heart disease, and that their replacement with either monounsaturated fatty acids or polyunsaturated fatty acids—including all Omega 3 and Omega 6 FA—reduces that risk.

But when I contacted Nestle in the summer of 2014, her position seemed less definite. For example, when I inquired about the wisdom of current official guidelines relating to intake of saturated fatty acids, most if not all of which warn the entire public against consumption greater than ten percent—in some cases, more than six percent—of total calories, Nestle flatly replied, "I don't think the jury is in yet on this one."

So what's the problem? Despite consistency among official guidelines, the research community seems hopelessly—indeed, zealously—divided on the topic. Meanwhile, average Americans grow increasingly confused about dietary fats. Science is relentlessly progressive by nature, but its nutritional constituent appears paralyzed. Why?

Science is relentlessly progressive by nature, but its nutritional constituent appears paralyzed. Why?

Consider a recent wave of conflicting studies. In 2009, researchers led by Danish epidemiologist Marianne Jakobsen, pooled data from eleven cohort studies to examine the effects of replacing saturated fatty acids with monounsaturated fatty acids, polyunsaturated fatty acids, or carbohydrates on risk of coronary heart disease (Jakobsen et al. 2009). After four to ten years of follow-up, 5,249 coronary events and 2,155 coronary deaths among 344,696 participants, Jakobsen concluded that MUFA were unassociated, carbohydrates were modestly and directly associated, and PUFA were inversely associated with coronary events. The effect was not modified by age or gender.

Thus, consistent with conventional wisdom, this group argued that "replacing SFA intake with PUFA intake rather than MUFA or carbohydrate intake prevents CHD over a wide range of intakes and among all middle-aged and older men and women." Although such distinctions were not tested, Jakobsen also suggested that carbohydrate quality—i.e., fiber content, extent of processing, and glycemic index—might alter the analysis.

But the modern-day macronutrient wars erupted a year later when four American researchers led by Patty Siri-Tarino published a meta-analysis

of twenty-one studies finding "insufficient evidence . . . to conclude that dietary saturated fat is associated with an increased risk of CHD, stroke, or CVD" (Siri-Tarino et al. 2010a). In other words, this group's provocative judgment threatened to undercut the very foundation of the diet-heart hypothesis.

Arguably, however, the Americans' findings were not entirely hostile to those of Jakobsen. They acknowledged, for example, that a decreased risk often results when saturated fatty acids are replaced with PUFA. But their interpretation of the data suggested not that saturated fatty acids were independently problematic, but rather that the benefit of replacement might derive from either increased PUFA or the PUFA to SFA ratio.

> from the standpoint of implementation, further reductions in saturated fat intake usually involve… increased proportion of carbohydrate. . . . [But] the effect of higher carbohydrate diets, particularly those enriched in refined carbohydrates, coupled with the rising incidence of overweight and obesity, creates a metabolic state characterized by elevated triglycerides, reduced HDL cholesterol, and increased concentrations of small, dense LDL particles.

Similarly, the Americans noted that carbohydrate restriction (or weight loss absent restriction) had been shown to yield reductions in the total-cholesterol to high-density lipoprotein-cholesterol (HDL-C) ratio, apolipoprotein B, and the number of small, dense LDL particles. In Siri-Tarino's estimation, these markers were more closely associated with reduced cardiovascular disease risk than LDL-C, which "appears to be specific to [less dangerous and] larger more buoyant particles."

Siri-Tarino assailed not only existing and proposed guidelines, but the long-standing use of low-density lipoprotein-cholesterol (LDL-C) as the primary biomarker for cardiovascular disease risk as well.

In a companion opinion piece, the Americans commented further on the relationships between saturated fatty acids, carbohydrates, and the risk of cardiovascular disease (Siri-Tarino et al. 2010b). Therein, Siri-Tarino assailed not only existing and proposed guidelines, but the long-standing use of low-density lipoprotein-cholesterol (LDL-C) as the primary biomarker for cardiovascular disease risk as well:

> Recommendations for further reductions in saturated fat intake (e.g., to ≤ 7% of total energy) are based primarily on the prediction of a progressive reduction in CVD risk associated with greater reductions in LDL cholesterol. However,

The Americans finally emphasized the data's failure to support recommendations for reductions in saturated fatty acids below ten percent of total calories. While conceding that saturated fatty acids might raise cardiovascular disease risk by increasing inflammation and reducing insulin sensitivity, they insisted that their relative effect should be reevaluated "given the changing landscape of CVD risk factors." Dietary efforts to curb cardiovascular disease, they urged, "should primarily emphasize limitation of refined carbohydrate intakes and reduction in excess adiposity."

The professional response was both swift and severe (Letters 2010). Oxford University nutritionist Peter Scarborough denounced the Americans' methodological design along with their failure to recognize the "well established" association between saturated fatty acids, serum cholesterol, and cardiovascular disease. Siri-Tarino countered that her "overall results" remained "robust" and unaffected by "different analytic strategies" even after adjustment for the alleged methodological weakness.

Dutch researcher Martijn Katan criticized the group's reliance on the underlying studies' use of single-day dietary assessments, as opposed to multiday diet records. He insisted as well that, since fat-reduction recommendations had been issued fifty years ago, falling LDL-C concentrations had resulted in conspicuous declines in coronary heart disease. Finally, he questioned the interests of Siri-Tarino's colleague, Ronald Krauss, because of his "advisory activities for the dairy industry." Siri-Tarino acknowledged the underlying studies' limitations but argued that all dietary assessments had been subjected to a "quality score" that confirmed her final results. She also informed Katan that Krauss had discontinued his dairy industry associations years prior to publication.

In a separate editorial, Northwestern University preventive-medicine specialist Jeremiah Stamler—who had served with Ancel Keys on the American Heart Association's nutrition committee during the early 1960s—vigorously defended what he deemed an unwarranted attack on the diet-heart hypothesis (Stamler 2010):

> Do they doubt the validity of the equations of Keys . . . which are based on dozens of metabolic ward-type feeding experiments, showing independent relations of dietary SFA and cholesterol (direct) and [PUFA] (inverse) to cholesterol . . . findings that are repeatedly confirmed in observational and interventional studies in free-living

people? . . . Do they bring into question the classical findings?

Stamler accused Siri-Tarino of ignoring several important investigations, including the Seven Countries, Ni-Hon-San, and National Diet-Heart studies, along with the DASH/Omni-Heart and Multiple Risk Factor Intervention trials. He also challenged Siri-Tarino's emphasis on carbohydrate-induced dyslipidemia, wondering how she might explain why native Japanese have demonstrated favorable lipid profiles relative to American Japanese, despite their distinctly low-fat, high-carbohydrate diets.

Finally, Stamler denied that "limited data" supporting the differential effects of saturated fatty acids and carbohydrates on smaller or larger LDL particles could justify changes to the official guidelines. Indeed, nothing Siri-Tarino had to say, Stamler maintained, could "warrant modification of recommendations . . . beyond intensified emphasis on prevention and control of obesity."

But macronutrient guidelines would be challenged again in 2010 by NIH biochemist Christopher Ramsden. Although the American Heart Association, for example, recommended substantial replacement of saturated fatty acids with Omega-6 (*n*-6) PUFA-rich vegetable oils, Ramsden suspected that the underlying literature had failed to either (1) distinguish between interventions increasing *n*-6 PUFA specifically and those boosting both Omega-3 (*n*-3) and *n*-6 PUFA, or (2) compare the relative effects of these interventions on coronary heart disease outcomes.

Indeed, following their meta-analysis of "all randomized controlled trials that increased PUFA and reported relevant CHD outcomes," Ramsden's team calculated a 22 percent reduction in coronary heart disease risk for mixed *n*-3/*n*-6 PUFA diets, but a 13 percent *increase* in risk for specific *n*-6 diets (Ramsden et al. 2010). "These analyses were thus not appropriate," Ramsden decided, "for formulating advice specific to *n*-6 PUFA." Recommendations to increase *n*-6 PUFA "should be reconsidered," he warned, "because there is no indication of benefit, and there is a possibility of harm."

One year later—in ostensive disregard of Ramsden's findings—a diverse group consisting of members from both Jakobsen's and Siri-Tarino's 2010 teams and led by Danish nutritionist Arne Astrup decided to reevaluate saturated fatty acids in light of recently published evidence (Astrup et al. 2011). While now confessing the over-simplicity of the diet-heart hypothesis, this group predictably confirmed prior claims that saturated fatty acids should be replaced with PUFA but not refined carbohydrates. The data regarding MUFA, they added, were too limited to be instructive.

Astrup conceded as well that biomarkers other than LDL-C, including the total cholesterol to HDL-C ratio, non-HDL-C, and apolipoprotien B, can be more enlightening of cardiovascular disease risk. He also acknowledged that distinct saturated fatty acids have different physiological effects, depending on their complement of carbon atoms. For example, in terms of raising serum cholesterol levels, stearic acid (found in meat and cocoa butter) appears neutral, while lauric and palmitic acids (found, for example, in tropical oils and dairy, respectively) can be far more problematic.

So the consensus as of 2011, according to Astrup, was that "the effect of a specific food on risk of CVD cannot be determined simply on the basis of the fatty acid profile." Indeed, "the total matrix of a food is more important." Nevertheless, he advised, a "healthy dietary pattern is primarily plant-based and low in SFA."

Perhaps, but 2011 was a lifetime ago in the increasingly volatile world of nutrition science. Important questions about fats, carbohydrates, and various biomarkers and risk factors for coronary heart disease were raised and recognized. But ensuing research would reveal quite clearly that the macronutrient wars were just warming up. ■

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Acronyms in This Article

CHD	**coronary heart disease**
CVD	**cardiovascular disease**
SFA	**saturated fatty acids**
LDL	**low-density lipoprotein**
HDL	**high-density lipoprotein**
MUFA	**monounsaturated fatty acids**
PUFA	**polyunsaturated fatty acids**

[SKEPTICAL INQUIREE BENJAMIN RADFORD

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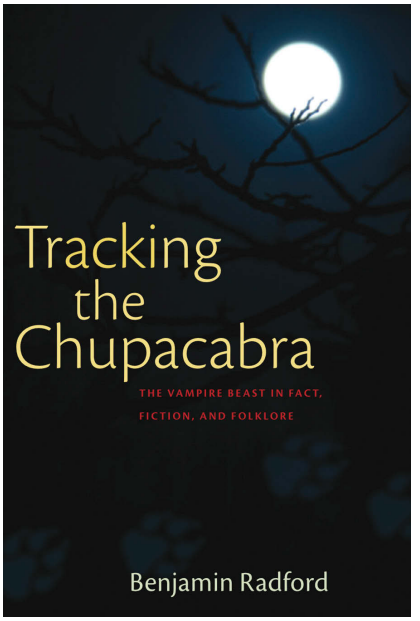
Texas Monsters and the Chupacabra

Q: **"I read your research claiming that the chupacabra didn't exist before 1995. I'm forty-three, grew up in the 1970s in Texas, and I am 100 percent certain that the chupacabra myth existed during my childhood. According to my grandfather, stories of it go back as far as his childhood. These were told to him by his grandpa, so add a couple more generations to that. There's a little town North of Abilene called Hawley. There they tell stories of a creature to scare the kids; some called him 'the Hawley goat-man' but those who could pronounce it called him 'chupacabra.' This creature matches the description, and his favorite meal is goats, hence the name. He was alleged to have glowing red eyes and jump great distances. I spent many nights staring out the window, terrified of brake lights in the distance or waking with nightmares of him jumping at me. . . ."**

—R. Culwell

A: As described here in the Skeptical Inquirer and in my book *Tracking the Chupacabra*, the origin of the mysterious vampire beast el chupacabra can be traced back to an eyewitness who saw the 1995 film *Species*, which featured an identical monster. Many people assume that the chupacabra dates back many decades, though in my research the best evidence is that it has only been around for twenty years. Vampire beliefs have existed for millennia all around the world—and there was a pre-existing belief that *something* mysterious was occasionally attacking animals prior to 1995 in Puerto Rico and elsewhere—but there seems no reference to a blood-sucking monster called "chupacabra" before mid-1995 in Puerto Rico or anywhere else.

Nonetheless, one common reaction I've gotten from readers such as Mr. Culwell is that the monster did indeed exist before 1995, because they



heard about it decades before (Radford 2011). Other lifelong Texans, however, inform me that they are just as certain that they'd *never* heard of the goatsucker until the late 1990s. Absent corroborating evidence, both positions are based on anecdotes and fallible memory and thus neither proves anything, which is why historical documentation is required to establish the truth.

In 2014, I examined what was claimed to be evidence of a 1950s-era chupacabra in Texas, captured in a photograph claimed to be of the monster. Though I solved the mystery, determining both the creature's identity and the photograph's origin (Radford 2014), that widely seen image may have contributed to the public perception that the chupacabra was reported in Texas at least a half-century ago. Memory research has shown that the perception that something has been around for a long time influences our beliefs and recollections (for example, Braun et al. 2002). In this light, it seems quite possible that people who are certain they grew up hearing tales of the chupacabra may be sincerely but incorrectly remembering the dates and details of when they first heard about it.

Goatman, Goatsuckers, and the Lake Worth Monster

I did my best to research Culwell's claim

that the "Goat-Man" of Hawley, Texas, was an early report of the chupacabra. I consulted a dozen cryptozoological sources, among them *Monster Spotter's Guide to North America* (Francis 2007); *The Field Guide to North American Monsters* (Blackman 1998); *Mysterious Creatures: A Guide to Cryptozoology* (Eberhart 2002); *The Encyclopedia of Cryptozoology: A Global Guide* (Newton 2005); and *The Field Guide to Bigfoot, Yeti, and Other Mystery Primates Worldwide* (Coleman and Huyghe 1999).

Most of them had some mention of a Goat Man—reported in Prince Georges County, Maryland. Reports vary, though most describe him as a half-human, half-goat Satyr-like creature with the upper body of a human and covered in coarse back hair. From the nubs or horns on his head to the "long beard that dangles from his pointed chin" to the cloven hooves, "Goatman is often mistaken for Satan" (Blackman 1998, 168). The creature was reported to be about six feet tall and have blazing red eyes[1]. This Satanic Maryland Goat Man is clearly not the chupacabra.

A 2014 book titled *Goatman: Flesh or Folklore?* doesn't contain a single reference to any Goat Man in Hawley or nearby Abilene, Texas (Couch 2014). I'm not familiar with the author or the quality of his research, but presumably if the Goat Man of Hawley is as prominent as Culwell suggests, it would merit at least a mention in a book dedicated to the subject. In *Monsters of Texas* by Ken Gerhard and Nick Redfern, the authors devote an entire chapter to "Goat Man Terror." The research centers around a "truly vile and monstrous looking creature [that] came storming out of the thick branches of a large nearby tree. Reportedly covered in a coat that seemed to be comprised of both scales and fur," it tried to grab a woman in the summer of 1969 at Lake Worth, near Fort Worth. Loren Coleman quotes an eyewitness as reporting that the hairy beast looked like "a cross between a human being and a gorilla or ape" (Coleman and Huyghe 1999, 58). This, of course, is a classic Bigfoot description (though with white fur), and though Coleman notes that the Lake Worth Monster is also known as Goatman, he offers no explanation for this appellation, and it's not clear from his account where the "goat" element came into the legend.

In his book *Monster Spotter's Guide to North America*, Scott Francis offers a different and more chimerical description of the Lake Worth Monster, quoting from the *Fort Worth Star-Telegram* as "being a 'fishy man-goat,' this beast has the legs of a goat and the upper body of a Sasquatch or ape. It is covered in white fur and has scaly skin around its eyes" (Francis 2007, 134). The *Encyclopedia of Cryptozoology* offers a similar description: "witnesses described it as 'a cross between a man and a goat,' covered in both fur and scales" (Newton 2005, 255). Author Michael Newton suggests that the Lake Worth Monster "may had [*sic*] been an albino Bigfoot or North American Ape," curiously ignoring the fact that Bigfoot are not reported to have scales or goatlike legs or hooves.

Newton places the Goat Man firmly in Maryland, but also offers a possible connection between the Maryland Goat Man and Texas, writing that "A curious twist was added to the Goatman legend in 1998, when the name was applied to a 'hairy, horned monster' sighted in northern McLennan County, Texas" (Newton 2005, 176). This would seem to place a Goat Man report around Waco, Texas, and he provides a reference to a Waco newspaper I've been unable to locate. However, as Hawley is over 200 miles away from Waco, it's unlikely to be connected to any chupacabra reports there—which in any event according to Culwell predate the 1998 incident by decades.

This is the main Texas-related Goat Man report. However, there are several problems with connecting it to the Goat

An alleged chupacabra (left), later identified as a coyote, found in Blanco, Texas, in 2009, as prepared by taxidermist Jerry Ayer and later sold to a creationist museum. Photo by Jerry Ayer and used by permission. Texas rancher Phylis Canion displays the head of a canid "chupacabra" (right, later identified through DNA testing as a coyote) found near her home in Cuero in 2007. Photo by the author.

Man of Hawley, much less a chupacabra. The "scales and fur" coated creature bears little resemblance to most reports of the chupacabra, and anyway this alleged encounter happened near Fort Worth, which is over 160 miles east of Hawley. Redfern notes that during one encounter with the Goat Man when locals chased the Bigfoot-like creature, "towering over the crowd at approximately ten yards, the Goat Man hurled a huge tire at the group, which resulted in the throng wildly scattering in all directions" (Gerhard and Redfern 2010, 84). In an interesting side note that might easily be conflated with chupacabra folklore, Redfern notes that "there were disturbing tales of horrific mutilations of animals in the area: dogs, cats, and more—most of which surfaced amid theories that the Goat Man had made a home" nearby (Gerhard and Redfern 2010). Though the chupacabra is less associated with animal mutilation *per se* than it is with animal vampirism, the similarity between the two monsters is notable.

The Hawley Monster

There is another candidate for Culwell's recollection of an unknown animal in the area. There was, in fact, a mysterious creature reported in Hawley, Texas, decades ago. It was not described as a Goat Man or a chupacabra, nor did it seem to share any characteristics of the chupacabra. It was called "Hawley Him," and in his book *Sasquatch: The Apes Among Us,* veteran Bigfoot researcher John Green offers a Bigfoot report from Hawley: "The *Abilene Morning Reporter-News*, July 7, 1977, reported the return of the 'Hawley Him.' Two teenagers at work clearing brush on a ranch claimed that rocks had been thrown at them by a seven-foot 'kind of ape but still a man' with huge arms hanging to its knees. They ran to tell their employer, whose teen-aged daughter returned with them, armed with a 30-30. All three saw the thing and one of the boys shot at it, but missed. It left tracks only a foot long" (Green 2006, 188). Green's phrase "the return of" suggests prior Hawley Him sightings, which might be interesting to research but are irrelevant here since neither its name nor description has any connection to the chupacabra.

So we have a caprine Goat Man in Maryland, a Bigfoot-like Lake Worth Monster, and a Hawley Him in Texas—all of which are clearly not the chupacabra and none of whom are claimed to have an appetite for goats. There is some overlap in the characteristics of these Texas creatures, and it's not difficult to see how a chupacabra "goat sucker" might easily become lumped together with the others in regional cryptid folklore. Folklore is fluid, with ideas, names, and characteristics that can be conflated and confused by many processes, including mistaken eyewitnesses, mystery-mongering books and TV shows, a Texan love of tall tales, and ordinary faulty memory. If a person mistakenly believes or remembers (or was told by someone else who mistakenly believes or remembers) that decades ago some people used to refer to a given mystery monster or folkloric figure as a "chupacabra," that can easily become part of the lore.

The important distinction between "something that looks kind of like a goat" and "something that sucks the blood from goats" is clear to a scholarly cryptozoology researcher but may become easily blurred though the process of storytelling and folklore-making. To someone telling the story, the distinction may be irrelevant; either can be called a "Goat-something" and anyway the goal is to tell a fun and captivating story, not to get bogged down in details and thorny contradictions. It's a simple and innocent process, but one that can require much time and effort on the part of a folklorist or researcher to untangle and clarify.

I believe I've done due diligence on this matter. The burden of proof is not on me to prove that the Hawley Him/Goat Man, the Lake Worth Monster, or any other Texas cryptid was never called (or confused with) a chupacabra by anyone before the 1990s. I can't prove a negative, and even if somehow the word *chupacabra* was applied to an early Texas monster (unlikely given its apparent mid-1990s provenance), it will not do to simply redefine "chupacabra" as merely a version of a Lone Star Bigfoot; the chupacabra has several forms (such as a spiky-backed, alien-esque, nearly-hairless bipedal creature and a mangy, four-legged canid) but none of them can be credibly mistaken for an albino Bigfoot or seven-foot-tall apeman. If any readers have information about a vampiric monster resembling the chupacabra—or called that—reported or discussed in Texas before the 1990s, please let me know. ■

Acknowledgments

Thanks to Craig Woolheater, Ken Gerhard, and Nate Riddle for their research help.

Note

1. The reference to glowing red eyes is a common characteristic of many monsters, including the chupacabra, mothman, and the Jersey Devil.

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Vaccines and the Anti-Vaccination Movement

An Interview with Dr. Paul Offit

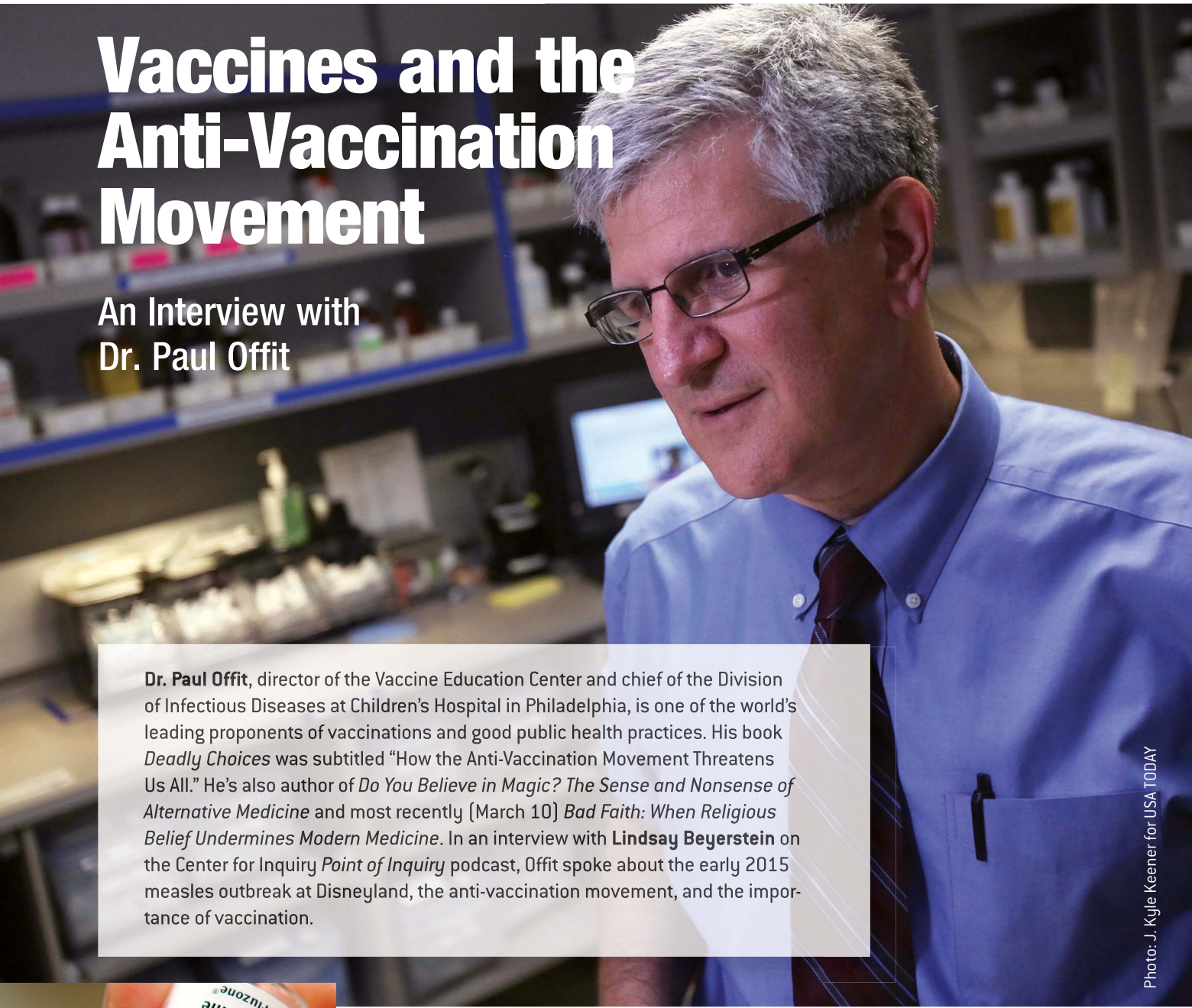
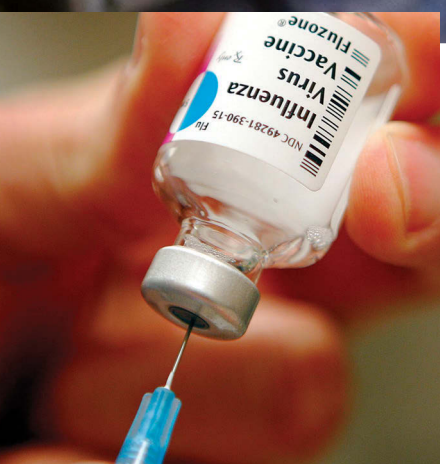


Photo: J. Kyle Keener for USA TODAY

Dr. Paul Offit, director of the Vaccine Education Center and chief of the Division of Infectious Diseases at Children's Hospital in Philadelphia, is one of the world's leading proponents of vaccinations and good public health practices. His book *Deadly Choices* was subtitled "How the Anti-Vaccination Movement Threatens Us All." He's also author of *Do You Believe in Magic? The Sense and Nonsense of Alternative Medicine* and most recently (March 10) *Bad Faith: When Religious Belief Undermines Modern Medicine*. In an interview with **Lindsay Beyerstein** on the Center for Inquiry *Point of Inquiry* podcast, Offit spoke about the early 2015 measles outbreak at Disneyland, the anti-vaccination movement, and the importance of vaccination.



LINDSAY BEYERSTEIN: Let's talk about the flu vaccine this year. What happened with it?

DR. PAUL OFFIT: I would say we're generally pretty good at figuring out what strands are about to circulate, and we do that usually a few months before we make the vaccine. We predicted basically what's circulating in South America because usually that's what comes up here and that was what was circulating. The problem is that one of the strands, the H3N2 strand, mutated enough away from what the vaccine strand was so that protective efficacy this year was woeful. It was in the 23 percent range, which is terrible. I don't remember a year like this actually, since I started to follow this for the last twenty years. This, I think, is the worst year we've had for protective efficacy in my memory.

BEYERSTEIN: How do you calculate protective efficacy?

OFFIT: You look at people who got the vaccine and those who didn't, then you look at

the infection rate of those who got the vaccine and those who didn't, and then you can figure out what the efficacy was. If 25 percent of people in the non-vaccinated group got sick and then only 2 percent of the vaccinated group got sick, the protective efficacy is about 90 percent.

Beyerstein: What is herd immunity, and what kind of vaccination rate do we need to sustain to keep herd immunity strong for measles?

Offit: Herd immunity just means that enough people are vaccinated in the population so that the virus or the bacteria has a lot of trouble spreading from one person to the next because so many people are vaccinated. In terms of the level of herd immunity that's necessary, it depends on the nature and contagiousness of the virus or bacteria you're trying to prevent. For these highly contagious viruses like measles, mumps, or chicken pox, you really need to have between 92 and 94 percent of the population immunized in order to prevent that spread.

For diseases that are less contagious, you don't need as high of a percentage because what happens is when herd immunity starts to fade, you see exactly what you're seeing now—which is the most contagious diseases come back first: measles, mumps, whooping cough. It's just what you would expect.

Beyerstein: A lot of people put their children at risk for religion. It seems like it's perfectly compatible with a lot of religious beliefs. There are people who recruit their children to be suicide bombers.

Offit: I don't know why. If you look, for example, at the followers of religions such as Christian Scientists, often these things are done in the name of Jesus, and I don't get that. I'm not a religious person but if one reads the New Testament, you can't help but be impressed by the figure described as Jesus. "Verily, I say unto you, what you do unto the least of my brethren, you do unto me." You put that on the entrance of every children's hospital in the world. This is a man who stood up for children at a time when infanticide was common, when abandonment was common, when child abuse was the crime embraced by the Roman Empire. You could argue independent of whether you believe in God or you believe Jesus was the son of God, the way Jesus is described in the New Testament he is a breakthrough character in terms of his defense of children. I don't get it.

Beyerstein: He also was pro-healing, and he never said you shouldn't have any healing except for me.

Offit: That's right. When you're sick, go to the doctor. In three of the four gospels that made it into the New Testament, that's what he says. I don't get it. What bothers me is when we had that outbreak in Philadelphia, it would have been nice for somebody who represented the church to stand up and say, "This is nuts. This is a distinctly un-Christian thing to do." That would have helped. I think our respect for religion is great to a point, but this is that point.

Beyerstein: Many of the anti-vaccination parents are well educated and affluent. Why do you think that they're such fertile ground for these crazy ideas?

Offit: I think they don't fear the disease. I think it's that simple. I think in Southern California, you're living this wealthy, upper middle class, upper-class environment. You're eating well, you're exercising. You don't see this disease so you think this is not going to happen to me, until it happens to you. That's the way it always works with these diseases.

Beyerstein: There is this group that you've identified as the vaccine hesitant parents, and you said that they have a big role to play in improving public health outcomes for vaccinations. Who are they and what can we do to get them on our side?

Offit: I think that's most people. We talk about the anti-vaccine movement, but the true anti-vaccine movement are the professionals—Barbara Loe Fisher at National Vaccine Information Center or J.B. Hanley at Generation Rescue, or people like Jenny McCarthy—but some are conspiracy theorists. They believe that there is a conspiracy between or among the federal government and the pharmaceutical industry and doctors to sort of push product, but you're not going to convince them. I think that's not most people.

Most people, there's just an anti-vaccine sentiment. They don't see the disease; they're not scared of the disease; they've read scary stuff on the Internet. They're not sure what they should do. I think those people are, for the most part, convincible. I think we just have to be a little more compelling in the way we try and convince them.

I think they don't fear the disease. I think it's that simple.

— Paul Offit

BEYERSTEIN: Are people more friendly toward, say, polio vaccinations because they know that polio means paralysis? I get the sense that people are less likely to want to refuse that than a measles vaccine or a diphtheria vaccine, or pertussis, that they don't even know what the disease really is.

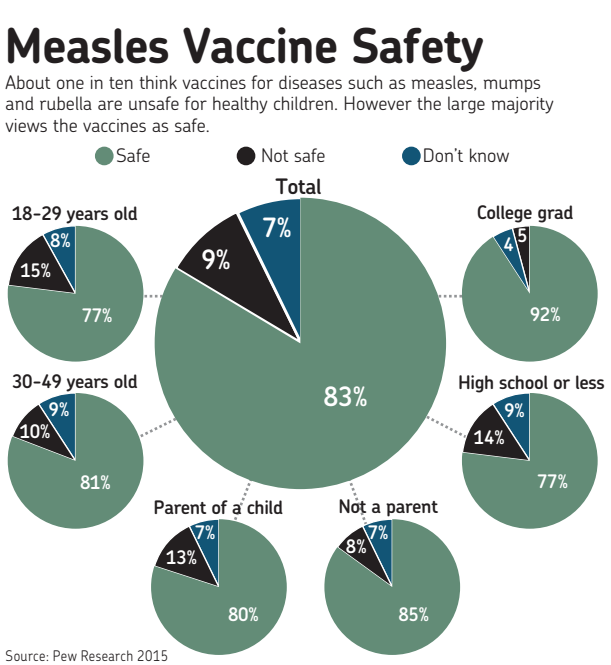
OFFIT: It's interesting, isn't it? People are hesitant to get an HPV vaccine, human papilloma virus vaccine, to prevent a disease that causes twenty-five thousand cases of cancer, four thousand deaths a year. Yet, they're happy to get a polio vaccine. We haven't had a case of polio in the United States since 1979. You're right. I think we're not very good at judging risk.

BEYERSTEIN: There was an op-ed in *USA Today* recently that was arguing that parents who refuse to vaccinate for mandatory vaccines should be jailed. Do you think that is acceptable or necessary?

OFFIT: No, I think that goes too far. We have three ways that you can choose not to get a vaccine in this country and one is a medical exemption. I think that's fine. I think this so-called personal belief exemption is nonsensical. Vaccines aren't a belief system. They're an evidence-based system. There's abundant evidence that shows they are what they claim to be. Again, I think a religious exemption is also nonsensical because it's an unreligious act. So don't give it the legal protections of religion. The notion that you're allowing people to put children at risk in the name of religion is, I think, averse to all, frankly, religions. I just wish we'd be more honest about this. If people choose not to get vaccinated it's because they're not scared of the disease, and they have false concerns about what the vaccine can do. That's what this is all about, so don't make it so easy for them to exempt themselves.

BEYERSTEIN: Who would you say are the biggest players in the anti-vaccine movement now, if you're looking at the people who are responsible for the sad state of vaccine public opinion?

OFFIT: I think it was the National Vaccine Information Center. They were born in the early 1980s. At the time, they were called "Dissatisfied Parents Together," or DPT. They were concerned that the wholesale pertussis vaccine, which was used then—pertussis being whooping cough—caused permanent brain damage, which was absolutely not true. It was shown in many studies not to be true. It's been more than thirty years and that kind of launched the notion that vaccines may be doing more harm than good. It's interesting, if you look at the measles outbreak in Southern California, a number of those people are over twenty. I think those are the first generation of children born of that sort of anti-vaccine sentiment of the early 1980s. . . . I definitely think that the anti-vaccine movement is losing ground. I think that the media have got far more responsible about covering this story. If you look at the way it was covered fifteen years ago, it was always this false mantra of balance, which is tell two sides of the story when only one side is supported by the science. . . . I think the media are much more responsible about this either because younger journalists are being trained in perspective and not false balance, or because the outbreaks are so egregious that you can't help but feel the choice not to get a vaccine was a bad one.



BEYERSTEIN: If you're a parent and you're concerned about vaccination levels at your kid's school, what can you do to change that to help protect people?

OFFIT: I think that you can attend a PTA meeting say, "Look, I think we should all care about each other. We all are responsible for each other." When a Jehovah's Witness, for example, chooses not to get a blood transfusion when they have a life-threatening loss of blood, they've made a decision for themselves and themselves only. They can't make that decision for the child. But you can make that decision for yourself, fine, that's fine. It doesn't affect anybody else. When you choose not to get a vaccine, that's a different story. Now you are saying, "It's my right to spread a potentially fatal infection."

This piece is adapted from a transcript of the February 2, 2015, *Point of Inquiry* podcast. The full interview can be heard at http://www.pointofinquiry.org/paul_offit_md_on_measles_in_the_magic_kingdom_and_the_anti-vaccine_movement/.

Bias in Reporting of Medical Research: How Dangerous Is It?

News media reports constantly bombard us with claims of major breakthroughs in the understanding and management of diseases. When we look more closely, much of the hype is illusory and can result in crushed hopes, financial losses, overly aggressive treatments, and even impaired health.

MORTON E. TAVEL

Various forms of bias, often occurring unwittingly, reduce the accuracy of published medical scientific studies. Although the depth of these distortions will likely never be precisely known, there are reasons to believe it is significant, especially as the biases arise from differing sources; some are discussed here.

Publication Bias

Inaccuracies often result from publication bias, which might be defined as the disproportionate publication of trial outcomes that do not represent the behavior of similarly treated individuals in the "real world" (i.e., in the population at large). We know that reports of test outcomes are preferentially accepted by scientific journals when they demonstrate "positive" outcomes—the apparent success of any given treatment. However, negative findings are seldom considered as an initial offering by standard journals; they are simply not as appealing or "groundbreaking" as are those that are positive. The editors themselves also have some stake in these acceptances, since publishing "striking" results can confer an aura of prestige to their journal.

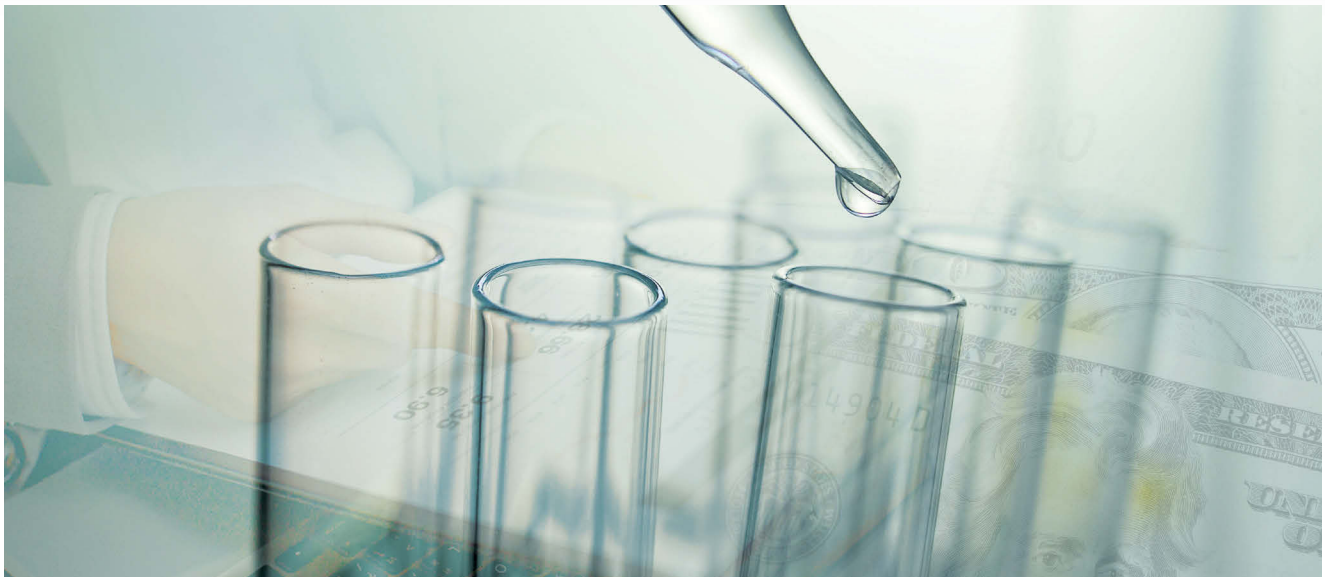
Supporting this premise, critical analyses (Dwan et al. 2013; Jones et al. 2013) have shown that trials with positive findings—showing statistically significant outcomes perceived to be important with positive effects of treatment—had nearly four times the odds of being published compared to findings that were perceived as unimportant or showed a negative or null direction of the treatment effect. These studies also disclosed that trials with positive findings also were published more quickly than trials with negative findings.

After initial positive results are published, other researchers are usually motivated to confirm or refute the findings. If a later study results in disagreement, the negative findings are then more readily accepted for publication, but this may not occur for months or even years. Not only does publication bias create a falsely high prevalence of positive results, but the studies are often picked up in the general media and touted as major breakthroughs. This can lead to a misinterpretation about the cause of a given disease or to inflated hopes that successful treatment is imminent. Unfortunately, the failure of initial hope—as determined by later research—rarely reaches these same publications, and the false hopes or expectations of the once-promised treatment persist.

News reporters may further amplify the findings through a process of "spin," defined as specific reporting strategies that emphasize the beneficial effect of an experimental treatment. In one systematic study (Yavchitz et al. 2012), "spin" was detected in about half of a large number of press and media releases. In detailed analysis, the main factor associated with the spin in these releases seemed to stem from positive conclusions in the abstracts in the research articles themselves. Undoubtedly, the reporters also played a role in this overemphasis, since they have to write in a way to appeal to their editors and readers.

The Meta-Analysis: An Incomplete Solution

In recent years, so-called "meta analyses" have gained popularity in medical research and reporting. In the attempt to achieve greater statistical power, meta-analyses pool the results from multiple studies. This form of analysis necessarily includes most of those original studies that were subject to the first level of bias already discussed. Efforts to construct statistical means to detect and quantify the degree



of bias (Kicinski 2014) appear to be useful in at least identifying the presence of bias, but they are similarly limited. Many of the creators of pooled analyses attempt to exclude studies that lacked rigorous reporting standards or were substandard in other ways, but they cannot totally overcome the initial publication bias. Many of the latter studies also are skewed toward positive, or active, treatments of various types. Interestingly (and inexplicably) trials with a smaller number of study subjects demonstrate the greatest bias favoring positive results (Kicinski 2014).

In order to reduce bias by selective exclusion in publications, the U.S. government has recently required entry of all large randomized studies of drugs and devices into a common database (it can be found at ClinicalTrials.gov). However, this attempt to eliminate exclusion of studies was limited. Of a number of large trials that were prospectively registered in ClinicalTrials.gov and completed before January 2009, only 50 percent had published results (Riveros et al. 2013). This leaves us with a large hiatus in knowledge about many large clinical trials—that portion with the greatest potential impact on clinical care.

Financial Forces

In a study noted above (Jones et al. 2013), a review of a large number of trials disclosed that non-publication was noted in 32 percent of those that received industry funding as opposed to 18 percent that did not. This leads to the inescapable conclusion that corporations—and pharmaceutical companies in particular—played a role in suppressing results that were not conducive to marketing their products. Moreover, Riveros and colleagues (2013) found that when the reported data included serious side effects, they were more thoroughly registered in the ClinicalTrials.gov database than in their subsequent publications.

In order to reduce bias by selective exclusion in publications, the U.S. government has recently required entry of all large randomized studies of drugs and devices into a common database.

This highlights the need for researchers and all caregivers to scrutinize these registered reports for greater accuracy. Data may still be withheld by those with financial interests, as reported by Ben Wolford in *Newsweek* (Nov 13, 2014). Wolford's report concerned the drug oseltamivir (Tamiflu), widely promoted for the prevention and treatment of influenza. The drug maker, Roche, had paid for dozens of clinical trials to prove this drug worked in practice. Afterward, the participating trial researchers produced lengthy "clinical study reports" and turned them over to the FDA, which approved the drug in 1999. Some of those reports were then condensed into short articles published in medical journals, which are usually the only means of reaching the medical practitioners and public.

After an outside impartial organization (Cochrane Collaboration) sought full disclosure from Roche, they found that the complete clinical study reports from those trials were locked away. This group negotiated with the

drug maker, filing freedom of information act requests to the FDA. Initially Roche offered to give Cochrane ten reports, but only if it signed a confidentiality agreement keeping everything secret—including the existence of the agreement. Cochrane refused to sign. After five years, Roche finally disclosed the findings, and what Cochrane uncovered was more than seventy Tamiflu trials and well over 100,000 pages of unpublished reports. Among them were many trials showing results that were negative or inconclusive. With this more complete picture of the testing, Cochrane concluded the trials didn't prove that Tamiflu prevents hospitalizations, contagiousness, or complications. The only thing it definitely does, Cochrane said, is shorten the duration of symptoms by about a day.

This is only one of many examples of blatant publication bias generated by a financial bottom line.

Research Errors

Various errors can result in major experimental biases, and this has been the subject of considerable attention in recent years. Aspiring researchers often wish to present positive results because this increases their likelihood of acceptance by a major journal, which in turn will enhance their scientific status, their chances of tenure, promotion, or fame. In addition, the pressure to publish creates potential biases toward conscious or unconscious manipulation of results in a positive direction, again slanted toward positive outcomes. Minor infractions of this type seldom trigger retractions, but they probably distort results to some degree. As the volume of published medical research expands, so too does the frequency of reported errors. According to a recent review in the August 11, 2011, *Wall Street Journal*, the number of studies published in research journals has risen 44 percent since 2001, but the number retracted due to inaccuracy has increased fifteen-fold in the same period.

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To determine whether these retractions were due to simple error or outright fraud, R.G. Steen (2010) reviewed 788 retracted studies involving medicine and other sciences, including biology, chemistry, pharmacology, physics, and others. He estimated that about 74 percent of these were retracted because of simple errors, and 26 percent due to fraud. What is even more disconcerting is that authors with a prior record of fraud were frequently guilty of repetitive violations. The delay between initial publication and subsequent retraction has also been steadily rising, from 5.25 months in 2000 to 31.6 months in 2009. This lengthy delay is hazardous to those trying to use the information to manage patients or to develop hypotheses for further study. Unfortunately, most scientific institutions and journals lack the resources to investigate misconduct properly, let alone ferret out errors in data acquisition and analysis. Fortunately, scientific methods almost always rely on duplication of results in other centers and verification through alternative means. Thus, while science is far from perfect, it is usually self-correcting in the long run.

Fallacies within Research Protocols

When we consider treatments of various kinds, conventional wisdom dictates that the double-blind controlled trial represents the "gold standard," of medical research, i.e., the highest level of proof that can be used to prove the efficacy of any type of treatment. This generally involves the acquisition of a large number of volunteers to participate, who are then divided randomly and equally into a "treated" group, given the active treatment, and a "control" group, given identical but inactive management, often in the form of a "dummy" pill (placebo). Neither the subjects receiving, nor those administering the tablets, know who is receiving the active treatment. Withholding of knowledge from both groups is called *double blinding*, and this is expected to ensure accuracy of results. In such studies, bias poses a two-way danger: If the subjects were to know they were receiving the placebo, they would more likely report a lack of success, in contrast to those believing they were receiving the "active" drug. Those dispensing the treatments also require blinding because of the possibility that they may reveal to the subjects through minor comments or "body language" what they are actually receiving, again potentially biasing the results. Another confounding influence is the so-called "enhanced placebo" effect (Kirsch 2011), which can cause the active agent under study to appear disproportionately effective. This effect occurs because potential side-effects of the active medicines are explained to the

subjects prior to the studies. When these effects are encountered during the study, subjects are more apt to conclude they are receiving the active drug rather than the placebo, thus encouraging the belief that they are more likely to gain better results, and this provides a boost toward favoring the new drug. Since most new drugs produce more side effects than do placebos, this paradoxically skews the results toward the belief that those individuals are receiving the active treatments.

During a double blind study, the results are usually monitored by a third party that confidentially maintains the information. After a suitable period of observation, the results are then tabulated and analyzed to ascertain whether or not the active agent reduced the prevalence of illness, when compared with the control group. If the frequency of illness is lessened, then statistical methods are employed to determine how likely this reduction could have occurred by chance factors alone. In general, if the analysis discloses a probability of less than 5 percent, the agent in question is generally deemed effective. Even then, the results of such individual studies are usually not considered absolute proof until other investigators in other locations independently confirm the results.

Many of these blinding techniques are far from ideal. Boutron et al. (2006) reviewed a large proportion of trials and found poor descriptions of blinding techniques as well as of fallacies in design. They also pointed out that results are especially subject to biased results if the outcomes were subjective, such as pain or depression, as opposed to objective outcomes such as heart attacks or cancer. Some protocols also cannot employ true double blinding because the administering personnel are aware of which group of the study individual subjects are assigned, as in the case of acupuncture described below.

Biased Results and Poor Management

In the case of drug trials, I have already described pitfalls that may lead to improper treatments. At least, despite some reservations, if these trials are truly double blinded and fully disclosed, they are likely to reflect a real treatment effect, if one is present.

Let's look closely at another trendy subject—acupuncture. Although this form of "treatment" has been around for centuries, it has been gaining in popularity in recent years. Although lacking biologic plausibility, this procedure has been advocated for all sorts of maladies and complaints, ranging from pains in all parts of the body to indigestion, irritable bowel syndrome, asthma, chronic lung disorders, and many others too numerous to mention.

True "double blinding" of acupuncture is virtually impossible for two reasons: 1) Those who are experienced in clinical acupuncture are the same ones who also regularly apply this technique in the research protocols. This introduces an automatic bias toward the expectation of success by the method upon which the therapist is already reliant—both emotionally and financially—for a livelihood. Concealing such expectations from subjects, even if desired, would be difficult, if not impossible. 2) Although more easily "blinded," sham acupuncture—needling with blunt instruments or at non-acupuncture sites in subjects serving as controls—is also likely to be suspected by these individuals, at least in some studies. This provides another potential confounder. The placebo effect itself is another factor to be considered, for as I have indicated in a recent review (Tavel 2014), this effect is especially profound in active procedures that include the "laying on of hands" as found in surgical or acupuncture procedures. With large placebo effects, as produced by acupuncture, any deviation from true double blinding will likely cause the placebo effect to distort the results in a way that enhances more greatly the apparently beneficial results of the treatment. By contrast, small placebo effects are far less likely to cause statistically significant deviations from a true treatment effect.

Where did this apparent general credibility for acupuncture originate? Numerous so-called "random controlled trials" have trumpeted the apparent efficacy of acupuncture, and many have been recently reviewed in a meta-analysis (Vickers et al. 2012). Vickers and colleagues concluded: "Significant differences between true and sham acupuncture indicate that acupuncture is more than a placebo. However, these differences are relatively modest, suggesting that factors in addition to the specific effects of needling are important contributors to the therapeutic effects of acupuncture."

With large placebo effects, as produced by acupuncture, any deviation from true double blinding will likely cause the placebo effect to distort the results in a way that enhances more greatly the apparently beneficial results of the treatment.

This statement alone must be considered a red flag for anyone critical of such a review, as I have indicated.

Having gained some measure of credibility, acupuncture is now employed as a regular component of "alternative" practitioners, and it has likely already irreversibly ingrained itself in our society. Adding even more to this illusion, I note that Mielczarek and Engler (2014) have reported in this publication that from 1999, schools for naturopaths, acupuncturists, chiropractors, and Oriental medicine practitioners have been recipients of over $2 billion of federal funding, meaning that even the United States government is granting tacit approval of these questionable methods. Moreover, many private insurance plans are also now covering acupuncture, although Medicare (parts A and B) does not presently provide compensation for this procedure. This means that we may be well on the way toward exposing our entire public to an enormous—and expensive—placebo effect, placing them also at the mercy of nonconventional practitioners, all based upon the strong likelihood of biased reporting! Unfortunately, I fear that the train may have already left the station.

When studies first go public, the best policy is to be doubtful and avoid taking immediate action.

Countering Biased Reporting

What can physicians and the public do to counter the recurring waves of misleading and potentially dangerous false information? First, we must remain skeptical of the so-called randomized controlled trials and the meta-analyses upon which they are based. Publication of retractions of erroneous research does help, at least by encouraging honest researchers to be more careful in future studies. For obvious reasons, accelerating the process of publishing opposing results would be a step in the right direction. Forcing industrial sponsors to reveal the results of all trials, whether or not they are published in peer-reviewed journals, is also a necessary step. Perhaps most importantly, the medical profession and general public must be highly skeptical of initial reports about medical science claiming miraculous successes or breakthroughs. When studies first go public, the best policy is to be doubtful and avoid taking immediate action. We must wait sufficiently long to allow for the original reports to be either confirmed or refuted, or in some instances, for the possible exposure of wrongdoing. ■

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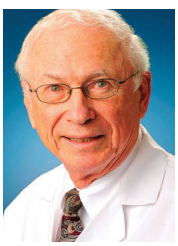

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The 'Food Babe': A Taste of Her Own Medicine

While "Food Babe" Vani Hari's pseudoscience has been widely debunked by qualified doctors and scientists, a more sobering fact seems to have escaped everyone's attention: one of America's most notorious bloggers is earning sales commissions from products that contain the very same ingredients she says are dangerous.

MARK AARON ALSIP

Vani Hari (the "Food Babe") has built quite a following for herself since her 2011 debut, with nearly one million followers on Facebook and a new book release in February 2015. While Hari's pseudoscience has been widely debunked by qualified scientists (e.g., Crislip 2013, Gorski 2014), a more sobering fact seems to have escaped everyone's attention: one of America's most notorious bloggers is earning sales commissions from products that contain the very same ingredients she says are dangerous. Ironically, for a web activist who seems to do most of her research via Google, the evidence is only a few mouse clicks away.

Vani Hari, the "Food Babe," is neither a scientist nor a nutritionist.

In her article "Throw This Out of Your Bathroom Cabinet Immediately," Hari links aluminum in modern deodorants to horrific diseases such as breast cancer and Alzheimer's (Hari 2013b). But in that same piece she recommends—and earns an Amazon.com affiliate commission from—*Naturally Fresh* deodorant, which contains ammonium alum and potassium alum (Naturally Fresh 2015). It's perplexing that Hari didn't take one additional step and look up these two compounds while writing her blog. She would have found they're better known as ammonium *aluminum* disulfate dodecahydrate and *aluminum* potassium sulfate (U.S. National Library of Medicine 2015a; 2015b). Yes, after warning about the dangers of aluminum in deodorants, Ms. Hari earns a commission on a deodorant that contains . . . aluminum.

Is this just a one-off mistake, poor research, or the use of scare tactics to sell competing products? You be the judge: In "The Ingredients in Sunscreen Destroying Your Health," Food Babe warns that applying vitamin A (retinyl palmitate) to your skin and going out in the sun puts one in danger of skin cancer (Hari 2013a). Yet she brings in affiliate dollars on skin care products that contain vita-

Yes, after warning about the dangers of aluminum in deodorants, Ms. Hari earns a commission on a deodorant that contains . . . aluminum.

Screen shot from the "Food Babe" Vani Hari's website.

min A, such as Tarte Blush. Affiliate links on FoodBabe.com lead the buyer to web pages that proudly proclaim retinyl palmitate among the ingredients (Tarte Cosmetics 2015a).

The vitamin A/skin cancer scare has already been debunked by experts (e.g., Wang et al. 2010), but that's beside the point. Hari makes the claim that vitamin A in skin care products is dangerous, yet she's profiting from the sales of such a product.

On that note . . . what *does* Food Babe recommend in a sunscreen? According to her, a must-have ingredient is titanium dioxide (TiO_2), and she provides a list of "acceptable" TiO_2-laden lotions (with the ever-present affiliate links). This is hypocritical; one of the Babe's most vocal and infamous campaigns has been against Starbucks for their use of a particular caramel coloring in spiced pumpkin lattes (Hari 2014). According to Hari, the coloring contains 4-Methylimidazole ("4-Mel"), classified as a group 2B carcinogen by the International Agency for Research on Cancer (IARC). Do you know what else is listed as a group 2B carcinogen? Titanium dioxide: her "gotta have" sunscreen ingredient (International Agency for Research on Cancer 2014).

DISSECTING STARBUCKS
"Pumpkin" Spice Latte
Think before you drink.
2 doses of Caramel Color Level IV, coloring made with ammonia and considered a carcinogen
Absolutely No Real Pumpkin in ingredients
Made with "Monsanto Milk" cows fed GMO corn, soy, and cottonseed or soy milk that contains Carrageenan stabilizer linked to intestinal inflammation and cancer
Toxic dose of Sugar ("Grande" has over 50 grams of sugar)
Ambiguous Natural Flavors that can be made from anything found on earth
Artificial Flavors made from substances like petroleum
Preservatives & Sulfites that can cause allergic reactions
Possible Pesticide Residue from using non-organic coffee beans
Contains condensed conventional milk, NOT VEGAN even with soy milk options
FoodBabe.com
FOOD BABE
#FoodBabeArmy
Vani Hari's "takedown" of the Starbucks pumpkin spice latte criticizes the use of a 2B carcinogen similar to the one found in her "gotta have" sunscreen.

For perspective, also on the IARC list are coffee, pickled vegetables, talc body powder, and the professions of carpentry and firefighting. But—relative safety of the additives aside—why is it okay to use scare tactics to frighten consumers away from a product then turn around and earn commissions on others in the same group? Food Babe identifies the IARC as the source for her 4-Mel cancer claim, so how did she miss the titanium dioxide? *It's on the same list*. Does the fact that she's helping sell products that contain TiO_2 have any bearing on her research?

Tim Berners-Lee invented the World Wide Web in 1989 as a research tool, and it can be powerful when used correctly. I'm not sure he imagined how badly it could be abused by "investigators" such as Vani Hari, who seem to give up the chase after a single mouse click. In "Be a Drug Store Beauty Drop Out!," she declares women must avoid beauty products with ingredients ending in "-siloxane" because they're supposed endocrine disruptors (Hari 2011a). Later, in an article for *Well & Good* magazine, she gushes about "Tarte Cosmetics Lights Camera Lashes Mascara" (Hari 2012). Not coincidentally, she earns a sales commission on this mascara. One more click of the mouse would have told her that it contains cyclopentasiloxane (Tarte Cosmetics 2015b). If you noticed that cyclopentasiloxane ends in "-siloxane" (the supposed endocrine disruptor), then congratulations: you've done more research than Food Babe.

What do leukemia, hummus, and facial cleansing milk have in common? In the world of Vani Hari, quite

The takeaway message is that Hari's science is as questionable as her investigative techniques. When given a taste of her own medicine—using a simple web browser to look up the ingredients of items she recommends—Food Babe's role as a safety advocate is cast in a new light.

a lot, apparently. Every night before going to bed, she washes her face in Avalon Organics Facial Cleansing Milk (Hari 2011b). Three months after she divulged this beauty secret, Hari solemnly warned her readers that packaged hummus was dangerous because it could contain: "Potassium Sorbate . . . known to cause skin allergies with prolonged use" and "Sodium Benzoate . . . when combined with Vitamin C . . . can produce benzene that has been known to cause Leukemia and other cancers" (Hari 2011c).

You've probably guessed by now what can be found in Food Babe's facial cleansing milk: potassium sorbate, sodium benzoate, and lemon peel—a rich source of vitamin C (Avalon Organics 2015). If these ingredients cause skin allergies and leukemia as Hari claims, why is she promoting them via her website?

These are just a few examples of products recommended by Food Babe that contain exactly the same ingredients she claims are dangerous. Catching her in the act is as simple as picking an additive from her "ban" list (Alsip 2014) and reading the label on an item she recommends. It's important to stress that experts in science and medicine have time and again debunked Hari's claims that the ingredients discussed in this piece are as dangerous as she claims. No one should walk away in fear of buying any of the products discussed here.

The takeaway message is that Hari's science is as questionable as her investigative techniques. When given a taste of her own medicine—using a simple web browser to look up the ingredients of items she recommends—Food Babe's role as a safety advocate is cast in a new light. The fact that she openly earns sales commissions on products pushed via her website should give us all pause for thought. ■

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WHO's Strategy on Traditional and Complementary Medicine

A Disgraceful Contempt for Evidence-Based Medicine

The World Health Organization once again advocates for implementing complementary and alternative medicine in national health services, jeopardizing global public health and evidence-based medicine.

THOMAS P.C. DORLO, WILLEM BETZ, AND CEES N.M. RENCKENS

Despite the increasing global recognition of the value of evidence-based medicine, the World Health Organization (WHO) still appears to be on a quest to promote the integration of consistently unproven and irrational therapies (quackery) into medicine worldwide. In a shameful recent advertising supplement in *Science*, fully sponsored by two Chinese universities, Margaret Chan, director-general of the WHO, calls once again for integrating traditional medicine (TM) with scientific medicine:

> For many millions of people, often living in rural areas within developing countries, herbal medicines, traditional treatments, and traditional practitioners are the main—and sometimes the only—source of health care. The affordability of most traditional medicines makes them all the more attractive at a time of soaring health care costs and widespread austerity. . . . In wealthy countries, TM meets an additional set of needs. People increasingly seek natural products and want to have more control over their health. They turn to TM to relieve common symptoms, improve their quality of life, and protect against illness and diseases in a holistic, nonspecialized way. (Chan 2014)

The typical logical fallacies commonly displayed by pro-alternative supporters are flagrantly apparent in her discourse; we can recognize the naturalistic fallacy, argument from popularity, argument from antiquity, etc. Worse, her words imply that any reasonable quality standards for health care can be disregarded for the poor. This corresponds to nothing less than double standards in global health care. Her statements are a painful illustration of the course the WHO has taken since 2002 and can be seen as a follow up on the publication of the *WHO TM Strategy 2014-2023* earlier last year. This strategic document, which like the *Science* supplement was financially supported by China, urgently needs our attention as it prioritizes political preference and commercial value of an important Chinese export product over the advancement of global health. (For more on the *Science* TCM supplement, see David Gorski's article in this issue, p. 46.)

Reinvigorating a Traditional Strategy

At the start of 2014, the WHO reinvigorated its strategy to boost the use of TM, nine years after its previous strategy report expired. In the new report *WHO TM Strategy 2014-2023*, the WHO persistently entangles the definitions of TM and "complementary and alternative medicine" (CM), including botanical medicine (World Health Organization 2013). CM includes all kinds of unproven therapies such as acupuncture, homeopathy, chiropractic, and anthroposophic therapy. This strategy follows the Declaration of Alma Ata (World Health Organization 1978) that positioned the traditional healers within the primary health care and the previous *WHO TM Strategy 2002-2005* (World Health Organization 2002). The current renewal of the strategy is the result of a resolution accepted by the World Health Assembly (WHA) in 2009, stating that an update of its predecessor was timely. This WHA resolution (WHA62.13), it

ALEXANDRE GELEBART/SIPA

Margaret Chan, director-general of the World Health Organization, has called for integrating traditional medicine with scientific medicine.

says, demands the adoption, implementation, and integration of T&CM (WHO's eclectic collection of traditional and alternative therapies together under one umbrella) into the health system of the member states "where appropriate, based on safety, efficacy, and quality." The resolution urges the WHO to assist the member states in this process as much as possible.

The resulting WHO TM strategy report that was published last year was mainly inspired by China and sponsored by the Chinese government, a major exporter of traditional remedies, and its contents were predictable. Without demonstrating any awareness of the virtually complete absence of evidence for both TM and CM, the strategy defines its own goals as "harnessing" the contribution of T&CM to health care and "promoting the safe and effective use of T&CM by the member states." According to the new strategy, member states experience difficulties with respect to the development of policy and regulations of T&CM, the integration of T&CM in the national health systems, assessment of safety of products and practitioners, research and development, and the sharing of information between countries. The report gives some statistical data regarding the increasing popularity of CM in developed countries and stresses the cheapness of TM in developing countries as a major advantage, forgetting that much T&CM is far from cheap and, more important, that comparing costs without evaluating efficacy can lead to absurd recommendations. The selection of references shows a strong pro-T&CM preference and uncritical appraisal. Critical papers demonstrating the decline and the lack of scientific support for CM are systematically neglected (Shang et al. 2005). After many decades of research on this issue (for example by the NIH's National Center for Complementary and Alternative Medicine, which spent almost $2 billion on this matter), no convincing evidence to support the practice of any CM has been found (Mielczarek and Engler 2012), except for a few botanical products now justifiably incorporated into conventional medicine. Critical and robust science regarding the proof of efficacy of TM is very rare and the outlook for this branch of medicinal folklore is bleak. Politically touted praise for TM by the WHA and the demand for mutual respect between traditional healers and medical doctors are not in the interest of global health and are outdated. The EU rules on safety and efficacy of med-

The resulting WHO traditional medicine strategy report that was published last year was mainly inspired by China and sponsored by the Chinese government, a major exporter of traditional remedies, and its contents were predictable.

ication have led to the disappearance of thousands of traditional remedies from pharmacies. Should they be reinstated? Is the WHO really advancing global health by promoting both TM and CM?

Traditional and Complementary Medicine: Any Common Ground?

The actual definition of T&CM in the WHO's report is so vague that it could be used for almost any form of therapy, product, diagnostic, therapeutic procedure, or ritual, as long as there is no convincing proof for its efficacy. There is actually little "traditional" about all the Western CM therapies. The currently prevailing alternative therapies have only in the last few decades gained popularity in Western countries over the more traditional therapies such as traditional herbal therapy, magnetizing, and naturopathy. These have nearly vanished, which in itself certainly has to be considered as progress, but they have been replaced by more modern CM therapies, such as those we have mentioned. The adjective "complementary" in "complementary medicine" implies that it has added value or improves the regular medicine to which it is added. This is deceptive phrasing, because it remains unclear what unproven alternative therapies such as homeopathy and anthroposophic medicine, essentially "quack" therapies that have been widely criticized, can add to regular medicine. In well-designed randomized clinical trials, the efficacy of CM therapies could not be established. More importantly, their underlying theories are incompatible with current scientific ideas at large, and thus there is no rationale for these therapies (Puustinen 2014; *The Lancet* Editors 2005). They are not always harmless; at best they only delay any effective treatment and leave the patient with an absurd concept of pathophysiology and disease. The report claims, but does not prove, that CM has great value in prevention or health maintenance. The anti-vaccination attitude among homeopaths, anthroposophists, and chiropractors points in a completely different direction (Carillo-Santisteve and Lopalco 2012). If any "complementary" therapy would be effective and exhibit therapeutic value, by the rules of evidence-based medicine, it would of course have been incorporated into regular medicine and the prefix "complementary" would no longer be adequate.

If any "complementary" therapy would be effective and exhibit therapeutic value, by the rules of evidence-based medicine, it would of course have been incorporated into regular medicine and the prefix "complementary" would no longer be adequate.

Traveling Together

Traditional medicine, such as that practiced in Asia and Africa, consists of a mixed bag of therapies (e.g., plant-, animal-, spiritual-, and energy-based). Some of these traditional therapies have a rational theoretical base, but most of them do not. The same holds for the CM therapies, with a possible exception for some elements of manipulative therapy. As we have described, there are actually few similarities between the various TM and CM therapies. But the adherents of TM and CM found each other through a shared problem: they both remain unsupported by scientific evidence and are not generally accepted in the world of evidence-based medicine. Therefore, they travel together and misuse the numerical majority in the WHA to gain acceptance by political means.

Curiously, the focus of the *WHO TM Strategy* is neither toward rigid proof of efficacy of the mixed bag of therapies nor toward access to effective therapy but seems to be aimed at the financial and intellectual property (IP) aspects: commercialization, reimbursement, and protection of IP. For China, the Chinese TM therapies are a hugely important export product worth $3.14 billion in 2013 (Ying 2014). The Chinese government clearly seeks recognition and legitimacy of these traditional therapies. It wants to claim they have efficacy, safety, and quality so it can export even more of them. But a lack of proven efficacy and guaranteed safety has limited the possibilities of approval through the conventional medical regulatory authorities (Jia 2011). China is therefore circumventing the regular medicine legislation and is actively seeking other "marks" of quality, such as ISO certification of their products (International Organization for Standardization 2012). The financial support of the present *WHO TM Strategy* report might be another lobby effort of China for its export product.

Advancing Global Health?

While the lack of access to quality health care in many parts of the world is evident and requires urgent action from WHO member states, in our opinion the proposed strategy for increasing the rollout and strength of T&CM as proposed in the recent WHO strategy will only aggravate the situation. The universal right to health

demands universal access to *good quality* health care and medicines of proven efficacy. Whether or not a therapy is of good quality should be assessed by the rules of evidence-based medicine and confirmed by good-quality clinical trials. The report advocates "real world experiments," without explaining what that means. This expression was invented by vendors of therapies that failed the objective tests of randomized clinical trials. They try to gain acceptance based on testimonies, or "anecdotal evidence," which obviously does not equal proof of efficacy. Promoting a treatment solely based on satisfaction or popularity, without comparisons to a control group, will not bring the goal of access to efficacious treatments for all any closer.

Most Western complementary therapies (e.g., homeopathy) have already been extensively proven to be ineffective and should immediately be abandoned. Promising traditional therapies, which are compatible with established medical knowledge, need more extensive and rigid clinical evaluation before being promoted or regulated. However, evaluation of T&CM could become a never-ending story since most of these therapies do not have generally accepted rules or procedures, and individual therapists each practice their own version. Assumed safety, solely based on many years of use, is unacceptable and can in fact be life threatening, as illustrated by the Chinese nephropathy tragedy (De Broe 2012) and well-documented cases of heavy metal poisonings by Indian Ayurvedic products (Lynch and Braithwaite 2005; Saper et al. 2004). The correct order of procedures should be: register and define, evaluate, recognize, regulate, but integrate only after convincing proof of safety and efficacy. The WHO should not support and promote acceptance of non-evidence-based therapies based solely on popularity and tradition, not in rich countries and not in poor countries. It is unethical to integrate therapies in a national health-care system before convincing proof of efficacy and safety is provided.

The role of traditional healers in advancing global health might be to have them assist and become involved in the spread of regular evidence-based care and access to essential medicines. In that process, practitioners of proven medicine will gradually replace any unproven therapies and practices. It is a missed opportunity that the *WHO TM Strategy* does not describe this scenario and by doing so impedes effective health care for underprivileged patients in resource-poor regions. We regard this as a disgraceful example of political choices in an area that should be dominated by science. ■

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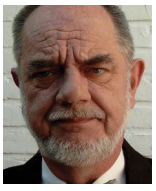

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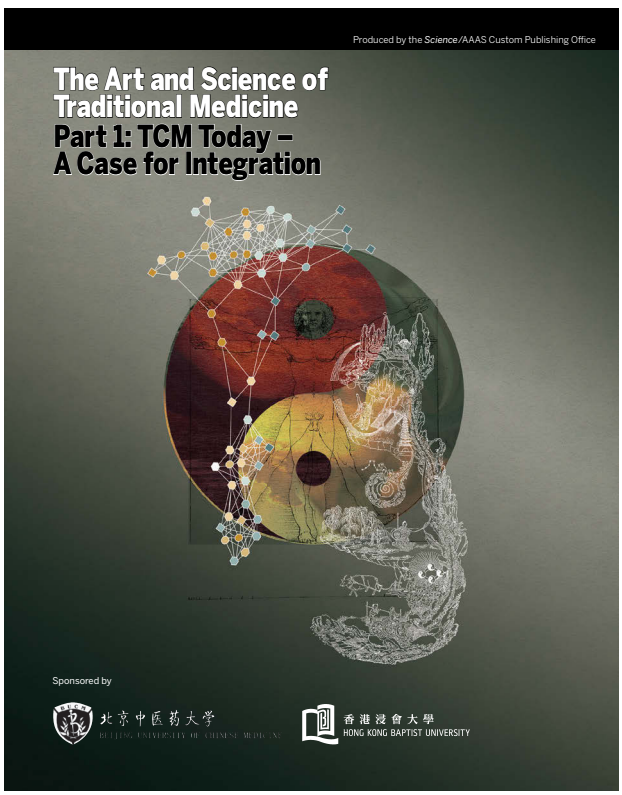
Science Sells Out: Advertising Traditional Chinese Medicine in Three Supplements

Did a leading scientific journal cross over the line from scientific publication to paid promotion of traditional and complementary medicine?

DAVID H. GORSKI

The National Center for Complementary and Integrative Health (NCCIH, formerly the National Center for Complementary and Alternative Medicine, or NCCAM) defines "alternative whole medical systems" as "complete medical systems outside of mainstream medicine based on concepts that vary widely depending on the whole medical system" (Gorski 2014). Examples of alternative whole medical systems include homeopathy, Ayurveda, and of course traditional Chinese medicine (TCM). Although homeopathy has been popular in Europe for many years, it appears to be on the decline because of its sheer scientific implausibility and the lack of compelling evidence for it. By contrast, in academia TCM has been on the rise as a "respectable" alternative whole medical system, as was highlighted last year when the Cleveland Clinic opened a traditional Chinese herbal clinic, complete with a naturopath carrying out "tongue diagnosis" (Reddy 2014). Indeed, the World Health Organization (WHO) has embraced TCM wholeheartedly without regard for science- or evidence-based medicine, as described in this very issue of SI (Dorlo et al. 2015), with its strategic plan advocating the "integration" of TCM into conventional medicine. It doesn't seem to matter that TCM, at its core, is based on prescientific concepts very similar to "Western" humoral theory, in which the five elements are substituted for the four humors and unscientific and unvalidated modalities such as pulse and tongue diagnosis are common. The latter are very similar to reflexology in which organs and body parts are said to correspond to areas on the tongue (Anastasi et al. 2009).

So seemingly respectable has TCM become that one of the most influential general science journals, *Science*, published a supplement titled *The Art and Science of Traditional Medicine*. Not only that, but *Science* published this supplement in three parts, the first in its December 19, 2014, issue, subtitled *Part 1: TCM Today—A Case for Integration* and the second in its January 15, 2015, issue, subtitled *Part 2: Multidisciplinary Approaches for Studying Traditional Medicine*. In both, the articles are formatted to appear not as ads but as regular scientific reports. As of this writing, part 3 has not been published yet, but the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first two installments are bad enough. The first installment contains an introduction proclaiming:

> In this first installment of a three part series, "The Art and Science of Traditional Medicine," we present a series of articles making a case for the integration of traditional Chinese medicine (TCM) into modern medical practice. From the new WHO Traditional Medicine Strategy to the application of systems biology in studying TCM, we aim to highlight the potential for creating an integrated, network-based health care system. The next two issues will cover herbal genomics and highlight the importance of quality control, standardization, regulation, and safety for traditional therapies. An overview of indigenous medicines in Europe, Africa, the Middle East, India, and the Americas will also be provided.

The supplement itself is described as having been "commissioned, edited, and published by the Science/AAAS Custom Publishing Office" and as not having "been peer-reviewed or assessed by the Editorial staff of the journal *Science*." Rather, "all manuscripts have been critically evaluated by an international editorial team consisting of experts in traditional medicine research selected by the project editor," with the intent of the supplement being "to provide a means for authors from institutions around the world to showcase their state-of-the-art traditional medicine research through review/perspective-type articles that highlight recent progress in this burgeoning area." *Science* then washes its hands of any responsibility, stating that the "editorial team and authors take full responsibility for the accuracy of the scientific content and the facts stated." This does not bode well for the scientific rigor of the articles in these supplements. Neither do the sponsors, the Beijing University of Chinese Medicine (described on its website as one of the "earliest established higher education institutions for Chinese medicine in the People's Republic of China") and Hong Kong Baptist University (whose website shows that it offers TCM, acupuncture, and moxibustion). In essence, this whole three-part supplement is an advertisement for TCM and other "traditional medicines," bought from the American Association for the Advancement of Science, *Science*'s publisher.

The editor of this project is Tai-Ping Fan, PhD, a professor of pharmacology at the University of Cambridge, who is described on UC's website as having "embarked on a quest to transform the art of TCM into a rigorous evidence-based science of healthcare and wellness." Fan loaded up the first two parts of the supplement with heavy hitters from the world of "integrative medicine," including the director of NCCIH, Josephine Briggs, MD; Jan van der Greef, PhD, a professor at the University of Leiden in the Netherlands who is known for applying modern genomics techniques to TCM; and Margaret Chan, MD, Director-General, WHO. Chan's advocacy of TCM, including a quote from her introduction to part 1 of the supplement (Chan 2014), has already been discussed in this issue (Dorlo et al. 2014); so I will concentrate more on other aspects of this travesty.

Notable is an editorial by Dr. Briggs, current director of the NCCIH (Briggs 2014). In it, Briggs invokes the logical fallacy of *argument from popularity* and states:

> For many living in developing economies, traditional healers and herbal remedies are the only source of available health care. In contrast, developed economies typically use these approaches as an optional complement to modern medicine, driven by patient preference. However, in both China and India, the ancient medical traditions—traditional Chinese medicine and Ayurvedic medicine—have flourished either in parallel or integrated with advanced modern care. Currently, in North America and Europe certain ancient healing practices—such as acupuncture, traditional Chinese medicine, massage, and meditation—have generated increasing interest and are seen as gentler, "low-tech" complements to conventional care.
>
> The persistence of such traditional practices in these settings suggests we have much to learn from them. Modern scientific methods can offer means to examine traditional practices.

In other words, argues Briggs, because a lot of people still believe in these practices, there must be something to them and they must be worth examining scientifically. One is tempted to retort that a lot of people believe that ghosts exist and that as a result scientists should devote more effort to studying the habits and behaviors of ghosts, or that because so many people don't believe in evolution that more study should be devoted to the idea that God or some other supernatural entity is responsible for the diversity of life on the planet. Again, the concepts behind

Science then washes its hands of any responsibility, stating that the "editorial team and authors take full responsibility for the accuracy of the scientific content and the facts stated." This does not bode well for the scientific rigor of the articles in these supplements.

TCM are prescientific and rooted in vitalism, with the emphasis on *qi*, a life force that scientists have thus far been unable to detect but acupuncture practitioners, for example, claim is modulated by the needles to a healing effect. It must be conceded that some herbs used by TCM practitioners might actually have useful medical properties, but if so, that is due to specific chemicals within them that act as drugs, chemicals whose identities and activities can be elucidated through the science of pharmacognosy, the branch of pharmacology concerned with natural products.

Apparently money buys a lot, because even Alan Leshner, then CEO of the AAAS and Executive Publisher of *Science* (he retired in mid-February), contributed a brief commentary (Leshner 2014). In it, he trots out a commonly used trope favored by advocates of alternative medicine:

> In discussions surrounding traditional healing techniques, a common perception is that those in the West most often take a reductionist approach to medicine, breaking down the body into ever-smaller parts in order to understand its inner workings. In the East, by contrast, medical practitioners are seen to take a more holistic view, regarding the body as a complex, integrated system and treating it as such.

This is a common stereotype promulgated by alternative medicine advocates attacking "Western medicine." Good science-based primary care medicine *is* holistic. It takes care of the whole patient. As for "reductionism," part of the reason medicine tended to be reductionistic in the past is because it just didn't have the tools to analyze more than one—or a handful—of genes or enzymes at a time. This, however, has rapidly changed over the past couple of decades with the advent of cDNA microarrays and then next generation sequencing, which can measure the expression of every known gene in the genome at once. Medicine has become more "systems-oriented" because it now has the tools to do so. That medicine and medical research have evolved this way has nothing to do with the attraction of TCM. Yet, that's exactly what Leshner seems to imply elsewhere in his article, that "Western medicine" is becoming more like TCM, which was right to be more "holistic." Leshner even concludes with the fallacy of the golden mean, citing the Buddha's "Middle Way" and wondering if perhaps a "Middle Way can be found for traditional medicine, one that takes the best of East and West and brings them together for the benefit of all."

It is a shameful thing when one of the most widely read general science journals in existence sells out by publishing, in essence, an advertisement for "integrating" a specific kind of pseudoscience into medicine. And this is not the first time: three years ago the other major general science journal, *Nature*, did the same thing (Traditional Asian Medicine 2011), except that its supplement was only one part and was bought and paid for by a Japanese supplement manufacturer as well as a TCM research center. Unfortunately, given the continued insinuation of traditional Chinese medicine into conventional medicine, there is no reason for other medical journals to turn down similar advertising supplements in the future. ■

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Editor's Note: We shared an advance copy of this article with the leadership of AAAS and *Science* and offered space here for a response. Alan Leshner declined, as he had just retired as CEO and Executive Publisher. Conversations with the Editor-in-Chief of *Science*, Marcia McNutt, confirmed that the supplement on traditional Chinese medicine "was conceived and executed completely independently of the processes, standards, and norms of the journal *Science*" (her words). At press time she relayed to us this word from new CEO and Executive Publisher Rush D. Holt and publisher Kent R. Anderson: "We're currently evaluating ways to better distinguish editorial content from sponsored content, and our experience with this three-part series will help inform those changes, going forward."

— Kendrick Frazier, Editor.

Pesticides: Just How Bad Are They?

Scientific balance and objective assessments of evidence are necessary to avoid biased and misleading answers to concerns about pesticides.

HARRIET HALL

I think everyone would agree that it would not be a good idea to put pesticides in a saltshaker and add them to our food at the table. But there is little agreement when it comes to their use in agriculture. How much gets into our food? What are the effects on our health or in the environment? Is there a safer alternative?

Where should we look to find science-based answers to those questions? One place we should *not* look is books written by biased nonscientists to advance their personal agendas. A friend recently sent me a prime example of such a book: *Myths of Safe Pesticides* by André Leu, an organic farmer whose opinions preceded his research and whose bias is revealed in the very title.

The Foreword and Introduction: A Bad First Impression

The Foreword to Leu's book is by Dr. Vandana Shiva, an environmentalist who blames Monsanto's GMO seeds and pesticides for causing 284,000 Indian farmers to commit suicide since 1995, a claim that is almost certainly false (Kloor 2014). She says pesticides don't even work in the first place: the brand Roundup is failing to control weeds and is creating superweeds, and "pesticides create pests." She is an alarmist who cites the Bhopal tragedy and Rachel Carson's *Silent Spring*. She says Leu's book synthesizes the scientific evidence of pesticides' harm to public health and provides evidence that pesticide-free alternatives are more productive.

Leu does collect a lot of evidence for the harms of pesticides, but he doesn't balance it with other evidence of benefits and safety. And his evidence for pesticide-free alternatives is far from convincing.

His Introduction begins with his personal observation of "so much illness in our communities, especially cancers, behavioral disorders, and degenerative diseases" and with his personal testimonial of getting sick every spraying season *even though no sprays are used on his farm*. He set out to find evidence to validate his belief that pesticides were responsible. Predictably, confirmation bias kicked right in and had a field day.

His bias even interferes with his reading comprehension. He says the US President's Cancer Panel report "clearly states that environmental toxins, including chemicals used in farming, are *the main cause of cancers*" [emphasis added] (President's Cancer Panel 2010). In fact it states no such thing! It says "the true burden of environmentally induced cancer has been grossly underestimated [at 6%]," and even that statement has been challenged by the American Cancer Society, whose representative said the panel restated hypotheses as facts and its conclusion does not represent scientific consensus (Nelson 2010). Tobacco causes 30 percent of all U.S. cancer deaths and another 30 percent are attributed to diet, obesity, and physical inactivity; and there are many other causes of cancer including alcohol, sun exposure, radon, medical radiation, infections, and occupational exposures. Pesticides are low on the list.

The Five 'Myths'

After finding such obvious errors in the Foreword and Introduction, I was tempted to drop the book in the wastepaper basket, but I persevered. Leu proceeds to address five "myths" in five chapters:

1. All agricultural poisons are scientifically tested to ensure safe use.
2. The residues are too low to cause any problems.
3. Modern pesticides rapidly degrade.
4. Regulatory authorities are reliable and trustworthy.
5. Pesticides are essential to farming.

"Myth" 1: All Agricultural Poisons Are Scientifically Tested to Ensure Safe Use.

Note the inflammatory choice of words: "poisons" rather than pesticides. It is true that many chemicals in use in the United States have not been adequately tested for safety, but even he himself admits that pesticides have been studied more than most other chemicals. Leu cites several of those studies. For instance, one study found 232 chemicals in the cord blood of newborns; some of those chemicals can harm brain development and the nervous system, but they have never been found to do so in the amounts detected. He criticizes current scientific testing methods as unsound and points out that the developing fetus may have special needs. Pesticide exposure has been linked to a number of health problems in children, including lower IQs, autism, ADHD, lack of physical coordination, loss of temper, bipolar illness, schizophrenia, and depression. These are reported correlations, not proven causations. He cites birth defects and gene alterations in mice exposed to pesticides, but there is no comparable evidence for humans. I agree that these studies are cause for concern and further research, but I think it is premature to draw firm conclusions or use that evidence to guide public policy.

"Myth" 2: The Residues Are Too Low to Cause Any Problems.

Leu says the lowest doses of some chemicals can be more toxic because they begin to act as hormones at those low levels. My colleagues and I have looked into endocrine disruptors and written about them on the *Science-Based Medicine* blog (Lipson 2009; Hall 2009; Hall 2011; Novella 2008); we were not particularly worried by what we found. Leu reproduces graphs showing increasing rates of diabetes, obesity, and thyroid cancer, and implies that endocrine disruptors are a major cause. He has a whole section on cell receptors that doesn't make sense; he tries to tell us that "key" molecules can only fit into the "lock" receptors when they are present in small numbers(!?). Yes, there are legitimate concerns about hormone disruption, but so far it's all hypotheses and no reliable conclusions. If there is any effect, it is small in magnitude.

"Myth" 3: Modern Pesticides Rapidly Degrade.

Dioxins are very persistent in the environment, and they can contaminate food. Pesticides can degrade into other chemical compounds that are harmful. Testing is not done on every possible pesticide and metabolite. Washing and peeling produce can reduce pesticide residues but can't eliminate them. He says the bulk of pesticides are inside the food, but that is only true for systemic pesticides that are absorbed by the plant and circulated through its tissues; other pesticides remain on the plant's surface and *can* be washed off or removed by peeling. For that matter, 99.99 percent of all the pesticides in our diet are natural components of the food—pesticides that plants produce naturally to protect themselves and that can't be eliminated (Ames 1990). Any synthetic pesticide residue is a drop in the bucket compared to the much larger concentrations of natural plant pesticides.

Some Facts and Balances

How much pesticide residue is actually present on our foods? The Pesticide Data Program of the USDA has been asking that question for twenty-two years now. In 2012, they sampled nearly 12,000 foods and found that residues were below EPA tolerance levels in over 99 percent. They concluded that "residues found in agricultural products sampled are at *levels that do not pose risk to consumers' health* (i.e., are safe according to EPA)" (USDA 2014). The World Health Organization and other organizations around the world are also monitoring pesticide residues and establishing tolerance levels, and there are international databases.

The obvious next question is how safe levels are determined. The EPA sets those levels and their website explains how they arrive at them (EPA 2007). They don't just make stuff up; they go by evidence and expert reasoning. Levels change as new evidence warrants it. The system isn't perfect, but it's reasonably good. A perfect system would be prohibitively expensive if not impossible to carry out to Leu's satisfaction.

One activist organization reports that eighty-six pesticides were found on cucumbers. That might sound scary, but what does it really mean? Modern analysis can find tiny trace amounts of

"Myth" 4: Regulatory Authorities Are Reliable and Trustworthy.

Leu doesn't trust authorities. He says, "History shows that regulatory authorities have consistently failed to prevent the contamination of the environment and human health by products previously designated safe, such as asbestos, lead, mercury, dioxins, PCBs, DDT, dieldrin, and other persistent organic pollutants."

That's horribly one-sided and unfair. He could have cited some of the many, many successes of government regulation in protecting public health and the environment; some of those successes involve the very contaminants he lists. He faults the government for continuing to allow mercury in fillings and vaccines, not acknowledging that mercury is no longer used in any vaccine except for the multidose injectable flu vaccine, and that there has never been any evidence of danger from the use of mercury in vaccines or fillings. He points out variations in regulations between different countries, and his simplistic explanation is "politics," whereas I think it is clearly more complicated than that.

Leu particularly targets glyphosate, showing nine graphs with correlations between glyphosate, GMOs, and everything from diabetes to intestinal infection. Apparently he thinks correlation means causation; it doesn't. He doesn't seem to know about that now-famous graph showing an almost perfect correlation between autism and organic food.

"Myth" 5: Pesticides Are Essential to Farming.

Leu cites a number of studies where organic farming practices produced greater yields than conventional methods. He shows evidence that organic crops are more resilient in adverse conditions like droughts, and that good practice organic systems produce higher yields in traditional small farm settings.

Recent advances in organic farming techniques are very encouraging, and anything that reduces the need for pesticides sounds like a good idea. But it remains to be seen whether the techniques can be implemented everywhere, whether "industrialized" large-scale organic farming can adopt them, and whether they are really the most practical way to increase yields and improve safety. It may be possible for farmers to eschew pesticides, but is it feasible on a large scale? Is it really preferable to judicious use of pesticides following best practices and evidence-based guidelines? Those are questions that science will be able to answer, but the necessary studies have not been done yet.

lots of things, but remember the old adage "The poison is in the dose." We know, for instance, that organophosphate pesticides are toxic and workers must take precautions, but we also know that ingesting one single molecule of even the most deadly poison will not result in any detectable harm. There is a legitimate concern that ingesting multiple chemicals at safe levels might add up to unsafe cumulative effects, and that infants and pregnant women might be at higher risk. This doesn't mean we should reject all pesticides on the precautionary principle; it only means more studies should be done.

It's important to put the harms of artificial pesticides into context. As Bruce Ames has pointed out:

> Carrots, celery, parsley, parsnips, mushrooms, cabbage, Brussels sprouts, mustard, basil, fennel, orange and grapefruit juices, pepper, cauliflower, broccoli, raspberry, and pineapple contain natural pesticides that cause cancer in rats or mice and that are present at levels ranging from 70 ppb (parts per billion) to 4 million ppb-levels that are enormously higher than the amounts of man-made pesticide residues in plant foods. (Ames 1989)

Any discussion of harms from pesticides should weigh the harms against the benefits. There certainly are benefits: pesticides have increased crop yields and helped humans in other ways (EPA 2012):

- Pesticides are the only effective means of controlling disease organisms, weeds, or insect pests in many circumstances.
- Consumers receive direct benefits from pesticides through wider selections and lower prices for food and clothing.
- Pesticides protect private, public, and commercial dwellings from structural damage associated with termite infestations.
- Pesticides contribute to enhanced human health by preventing disease outbreaks through the control of rodent and insect populations.
- Pesticides are used to sanitize our drinking and recreational water.
- Pesticides are used to disinfect indoor areas (e.g., kitchens, operating rooms, nursing homes) as well as dental and surgical instruments.
- The pesticide industry also provides benefits to society. For instance, local communities and state governments may be partially dependent upon the jobs and tax bases that pesticide manufacturers, distributors, dealers, commercial applicators, and farmers provide.

Incidentally, when plants are not exposed to artificial pesticides they tend to increase their production of natural pesticides. This phenomenon has not been well studied. The "natural" pesticides allowed in organic farming have not been studied anywhere nearly as thoroughly as the artificial ones. It is a fallacy to assume they are safer just because they are natural.

The news about health effects of pesticides is not all bad. A review of the literature concluded:

> When compared to the general population total mortality has been found to be consistently lower among pesticide manufacturers as well as among other groups of workers. This observation has been mostly attributed to the "healthy worker effect" or, in the case of agricultural workers, to the healthier lifestyle of farm families. With the exception of deaths by accidental causes, non-cancer causes of death (mainly represented by cardiovascular diseases), were generally found to be less frequent than expected among manufacturers or users of pesticides, in particular among farmers. No consistent evidence of global cancer mortality different from that of the general population has been reported among pesticide manufacturers or applicators. On the other hand, the papers examined have been strikingly consistent in reporting a low overall cancer risk among agricultural workers; lifestyle, clean air, low prevalence of smoking have been hypothesized so as to explain this observation. (Maroni and Fait 1993)

Conclusion

Pesticides are meant to harm weeds and insects, but are they also harming us? Leu demonizes pesticides as "poisons" and argues that the precautionary principle should make us eliminate their use entirely. I think he exaggerates the dangers, especially considering that evolution has equipped the human body to thrive while eating foods with levels of natural pesticides several orders of magnitude greater than the levels of artificial pesticides in today's foods. I certainly agree with him that there is a need for more research. He says safe pesticides are a myth, but I have to wonder if any evidence of safety would ever satisfy him; he seems to be demanding "perfect" safety like some anti-vaccine activists do. There is a danger to invoking the precautionary principle before ensuring that the alternatives are not worse.

This is what typically happens when a layman with an ax to grind ventures into the scientific arena looking for evidence to support his prior beliefs. A good scientist would look just as carefully for any evidence that might prove his hypothesis wrong. Leu's book stands in stark contrast to another book by a layman, Matt Fitzgerald, *Diet Cults: The Surprising Fallacy at the Core of Nutrition Fads and a Guide to Healthy Eating for the Rest of Us*. Unusually for a layman, Fitzgerald understands science better than many of the doctors who have written about nutrition. He approached his subject without bias, looked at the literature on both sides, and came to eminently reasonable conclusions. I reviewed his excellent book on the *Science-Based Medicine* blog (Hall 2014).

Leu's book is useful, but only as a handy compilation of things we ought to be thinking about—things that scientists are already addressing. ■

Note

This article was originally published on the *Science-Based Medicine* blog on December 9, 2014 (www.sciencebasedmedicine.org/pesticides-just-how-bad-are-they/).

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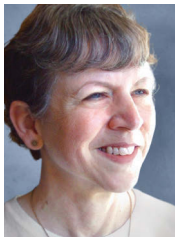

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Reams Urine & Saliva Testing: Don't Waste Your Money

From the wacky world of alternative medicine we have a completely useless set of 'medical' laboratory tests that are diagnostic of nothing except gullibility.

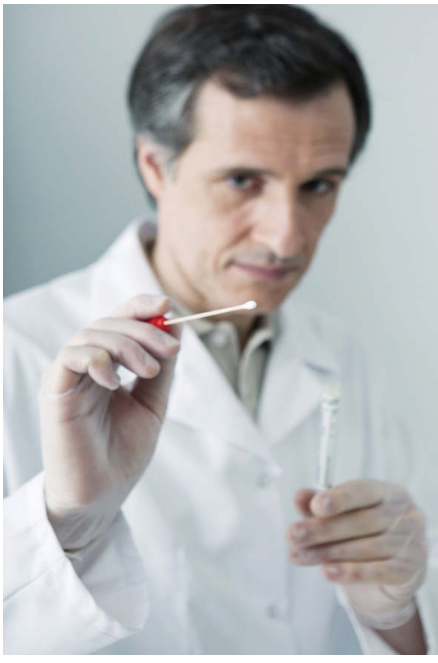
THOMAS PATTERSON

As an experienced medical laboratory scientist I am bound by my profession's code of ethics to shed light on a laboratory test that is useless for the diagnosis or evaluation of any disease. The American Society of Clinical Laboratory Scientist's Code of Ethics, Section 1, Duty to the Patient, states that it is our professional duty to safeguard the patient from incompetent or illegal practice by others.

Incompetent indeed! At the end of one of my immunology lectures, a student asked if I knew anything about the Reams urine and saliva test. I have been a professional in the clinical laboratory field for over thirty years, and I had never heard of such a test. We certainly don't teach this test in our clinical laboratory science program at our university, and after investigating this test I don't believe we ever will.

My first clue that the Reams urine and saliva test (also called the Reams Biological Theory of Ionization Test or RBTI) is completely useless is that the several websites that offer this test answer their own question: What does this test reveal? Well, according to these alternative medicine gurus, quite a lot: it supposedly determines the calcium needs for your body chemistry; tells what you are digesting and not digesting; shows vitamin and mineral deficiencies; reveals if your blood sugar is high, low, or normal; will show if your body is supporting excess yeast (candidiasis) or parasites; indicates if there is excess stress on your organs such as the kidneys, liver, heart, colon, or gall bladder; gives the health of the liver and gall bladder; and reveals if your body's environment may be supporting circulatory problems, high or low blood pressure, arthritis, weight gain, high cholesterol, or kidney/gall stones.

Several problems are evident right off the bat. Many of these issues are couched in alternative medicine speak. This test certainly cannot detect "stress" on any organ, whatever that means. A term like *stress* on the so-and-so organs is so vague as to be meaningless to medical professionals. There is no patient that could be admitted



This test certainly cannot detect "stress" on any organ, whatever that means. A term like *stress* on the so-and-so organs is so vague as to be meaningless to medical professionals.

to a hospital with a diagnosis of excess stress on the gall bladder. A physician trying to admit a patient with this sort of diagnosis on the basis of the results of this test would and should have his or her admitting privileges reviewed immediately.

Another clue that this test comes to us from the world of alternative medicine is that the test claims much too much information from an analysis of urine and saliva. Neither a urine nor a saliva test can evaluate the calcium needs of anyone. An analysis of urine and saliva cannot tell if you have high blood pressure or low blood pressure. A much better idea is to go to your local pharmacy and test your own blood pressure at their self-service blood pressure station.

Urine and saliva samples are never used to help diagnose arthritis, high cholesterol, parasites, or a yeast infection. Urine and saliva samples have little diagnostic value in detecting kidney or gall stones or vitamin and mineral deficiencies. And finally, how this test could possibly tell what one is digesting and not digesting escapes me.

This test also misses the mark on identifying people who may have high blood sugar. Persons with high blood sugar will have some glucose (sugar) in the urine but on careful examination I find that this test mistakenly measures several other things and identifies them as sugar. It tests for brix. Brace yourself! Brix is a measurement of the amount of sugar in grape juice so wine makers can calculate how much alcohol will be produced from the batch of juice that was tested. It is a simple test to perform; a drop of juice is placed in a refractometer and the specific gravity is read. A refractometer is a simple optical device that measures the bending of light by the solution being tested; the more dissolved substances in the solution, the more the light bends. The reading is converted to a brix scale that tells how many grams of sugar there are in 100 grams of juice solution, or the percent of sugar.

Specific gravity is simply a measurement of a solution compared to pure water. Pure water is 1.000 while solutions that have dissolved substances in them are slightly more dense than pure water and thus have a higher specific gravity than 1.000. So a specific gravity reading (or brix) on grape juice would be measuring sugar because that is what is dissolved in the juice. Those that offer the Reams test have somehow determined that a brix measurement of 1.5 is ideal while healing takes place in the 1.2 to 2.0 range.

A standard medical test for urine does include specific gravity, but an elevated reading is not due to sugar in a healthy individual. It is due to the concentration of the urine and the amount of dissolved substances like urea, sodium, potassium, etc., in the sample. The specific gravity tells the physician if the patient's kidneys have the ability to concentrate urine.

Using a brix scale to determine sugar in urine is meaningless because there is normally little to no sugar in human urine. Even if an individual has sugar in the urine, the brix scale is useless because one would also be measuring unknown concentrations of dissolved urea, sodium, potassium, etc. The practitioners explain that in addition to the sugar, the brix number represents the amount of potential energy available per pound of body weight. How they measure this amount of potential energy per pound of body weight and the units in which they measure it are unclear. What this nonsense means is anybody's guess. Any so-called "medical laboratory" using a brix winery scale to test urine should be thoroughly investigated.

This test also measures the pH of both urine and saliva. Promoters of this test explain that pH is a measurement of resistance and indicates the speed at which energy is moving through the body. Again, this is nonsense. Any student who has taken an introductory chemistry course knows that pH is a measure of the acidity or alkalinity of a solution, not a measure of energy speed. Technically pH is the negative log of the hydro-

Any student who has taken an introductory chemistry course knows that pH is a measure of the acidity or alkalinity of a solution, not a measure of energy speed.

gen ion (acid) concentration (Sackheim 1994, 199). It has nothing to do with the speed of energy moving through the body. This idea is meaningless anyway unless one is struck by lightning. During those milliseconds, one might be genuinely concerned about the speed at which energy is moving through the body.

The pH of urine is routinely measured in a medical laboratory, but it will be neutral, alkaline, or acidic because urine is the medium our bodies use to get rid of excess alkalinity or acidity to keep our blood at a healthy and slightly alkaline state. The pH of saliva is near neutral to keep acids from dissolving away our teeth (Sackheim 1994, 200). Saliva pH is a rarely ordered test because saliva's pH doesn't vary much and has little diagnostic value.

Cell debris is a term that is ill defined, and it is not measured in medical laboratories. In the Reams test, cell debris is apparently important and is measured in the urine in some mysterious fashion. Perhaps these people are looking at the turbidity of the urine. Some practitioners call this cell debris "albumen" [*sic*]. Evidently cell debris is the number of dead cells leaving the body. Someone, perhaps Dr. Cary Reams, the originator of this test, has decided that the ideal cell debris number is 0.04M. I have no idea where this number comes from or what it means or how it is measured.

This may be related to the so-called cell exchange rate, another meaningless parameter. Practitioners tell us there are three classes of cells: alpha cells, delta cells, and omega cells. Alpha cells are whole healthy cells, delta cells are damaged or dead cells, and omega cells are dead cells that are sticking together. This classification of cells based on lifespan is pure fantasy and cannot be found in any biology or medical textbook. Proponents claim that in a healthy cell exchange rate the number of healthy cells replaces the dying cells on a one to one ratio.

If these practitioners are looking at urine under a microscope, which I hope they are not, they will most likely see some cells, especially if the urine is from a female. Epithelial cells are often present in urine because they are naturally sloughed off during urination but this is completely normal. How they can tell if these cells are being replaced on a one-to-one basis is unknown. I have never seen a urinalysis report that listed the numbers of delta and omega cells found in a urine sample.

Proponents also claim that the urine requires a urea reading, urea being the "Ammonia Nitrates and the Nitrate Nitrates" in the urine. This is a big error; nitrates are not urea. Also, anyone familiar with chemistry knows that chemical names are not capitalized. I am not sure what "ammonia nitrates" are, but ammonium nitrate is fertilizer and should never be found in the urine.

One enthusiast claims that urea is the undigested protein in the body. This is simply wrong. Urea is a nitrogen-containing waste compound that is produced when protein is digested.

Nitrate is a molecule that is made up of one nitrogen and three oxygen atoms and is normally present in the urine. It is derived from our diet and is excreted by the kidneys. Nitrates are hardly ever measured in urine, as this test has very little diagnostic value. Their term *nitrate nitrates* is not used in actual science. A nitrite molecule is similar to a nitrate molecule except that it has one fewer oxygen atom. Urine can be tested for nitrites produced by bacteria, an indication of a urinary tract infection, but there is no actual test in existence for something called *nitrate nitrates* (Brunzel 2013, 123).

One enthusiast claims that urea is the undigested protein in the body. This is simply wrong. Urea is a nitrogen-containing waste compound that is produced when protein is digested (Sackheim 1994, 457). A high urea reading, according to this practitioner, is due to the "heart beating TOO HARD, NOT TOO FAST!" [*sic*]. The practitioner gives no explanation as to why undigested protein would make the heart beat

too hard or any explanation as to why some of these words are in all capital letters.

Urea has a completely different chemical structure than nitrate. The level of urea depends on the amount of protein in the diet, hydration, and kidney function. I have no idea what these alternative medicine proponents are doing, but if they are using nitrate to determine the amount of urea in a urine sample they are in error. These are two completely different substances. One does not count apples to determine how many oranges are available in the produce aisle.

Albumin (which they spell as "albumen") is a protein normally found in the blood. There may be significant amounts in the urine in individuals with some types of kidney disease or other conditions (Brunzel 2013, 83). Albumin is precisely measured in the laboratory through a chemical reaction.

One practitioner claims that albumin is the number of dead cells in the body (it is not) and that he can tell the amount of albumin by merely looking at the urine—no laboratory instrument needed: one only needs to hold the urine sample up to the light and look for a cloudy mass. The cloudy mass of albumin is supposedly carcinoma (another word for cancer) cells and the normal amount of these cells should be around 40,000 per 100 pounds of body weight. Claiming that 40,000 cancer cells in urine are normal defies all logic. Common sense would dictate that detecting any number of cancer cells is not normal let alone 40,000 of them per 100 pounds of body weight. Cloudiness in urine can be from many causes ranging from precipitated harmless substances to a bacterial infection, but urine cloudiness cannot be used to quantify albumin.

Urinary salt (sodium and chloride) is measured with a conductivity meter, and it is claimed that this is a measure of the amount of salt the body retains. These practitioners evidently do not understand that salt in the urine is the salt our bodies are *eliminating*, not the salt we are *retaining*. The amount of salt in our blood is critical and is kept within a very narrow range. Any excess salt is expelled through the urine (Sackheim 1994, 460).

So what does all of this nonsense mean? How can we interpret all of this information we get from testing our urine and saliva? According to the Reams biological theory of ionization, we merely line up these questionable laboratory values in a specific order and look at them: the brix, the urine pH, the saliva pH, total salt measurement, albumin, and the nitrate nitrogen over the ammonia nitrates. Evidently normal readings are: 1.5, 6.4, 6.4, 6-7, 0.04M, and 3/3, respectively, and anything other than these values indicates serious abnormalities that can be alleviated by, you guessed it, a carefully prescribed program of vitamin and mineral supplementation. So we can conclude that if our tests indicate stress on the gall bladder we can correct this debilitating condition by taking the proper supplements suggested by our local alternative medicine practitioner. The skillful sprinkling of science-like words and meaningless technical-sounding lab jibber jabber allow this silliness to take on a thin veneer of seeming legitimacy. Fascinating indeed!

One proponent of this test sums it up beautifully: "All living things operate within a measurable frequency and this test analyzes the frequency which a person gives off so we can see how much energy the body has, where it is escaping unnecessarily, and where the energy is being used (not being assimilated)." Now if that statement doesn't clear things up I don't know what does. This test is available for a price of between $90 and $150. My advice: don't waste your money unless you can figure out what in the world these people are talking about. I, for one, cannot. ■

The skillful sprinkling of science-like words and meaningless technical-sounding lab jibber jabber allow this silliness to take on a thin veneer of seeming legitimacy. Fascinating indeed!

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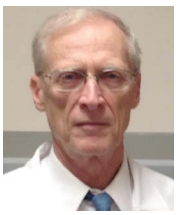

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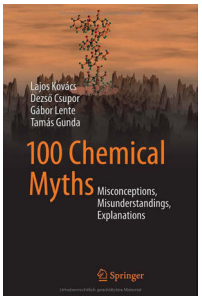
A Scientific Response to Chemophobia

HARRIET HALL



100 Chemical Myths: Misconceptions, Misunderstandings, Explanations. By Lajos Kovács, Dezsã Csupor, Gábor Lente, and Tamás Gunda. Springer, 2014. ISBN 978-3-319-08418-3 (hardcover) ISBN 978-3-319-08419-0 (e-book). 396 pp. Hardcover, $69.99. E-book, $49.99.

Would you drink a mixture of butanol, isoamyl alcohol, hexanol, tannin, benzoyl alcohol, caffeine, geraniol, quercetin, epicatechin-3-*O*-gallate, epigallocatechin-3-*O*-gallate, inorganic salts, and water? Popular food blogger Vani Hari, better known as the Food Babe, probably wouldn't. She rejects anything with ingredients she can't pronounce. That list of chemicals might sound appalling, but when you call it by its common name, tea, it's perfectly acceptable to most people.

One of the Sisyphean tasks of skeptics is to repeatedly counter knee-jerk chemophobia with reminders that everything is made of chemicals, that man-made chemicals are not categorically bad, and that the poison is in the dose. A new book provides a wealth of information to aid us in that task: *100 Chemical Myths: Misconceptions, Misunderstandings, Explanations*, by four Hungarian scientists, Lajos Kovács, Dezső Csupor, Gábor Lente, and Tamás Gunda. The foreword is by Joe Schwarcz, professor of chemistry and director of McGill University's Office for Science and Society. He is a Committee for Skeptical Inquiry fellow who has himself written countless books and articles about chemical myths. He gives the book high praise, and not just because he grew up in Hungary.

As modern technology improves our lives, its benefits are taken for granted and new concerns emerge. There are legitimate concerns such as industrial accidents and pollution, but there are also overblown fears; humans are not very good at assessing the magnitude of risks. People worry about the 0.09 mg of artificial pesticides that contaminate our foods and forget that we ingest an average of 1,500 mg of natural pesticides each day from natural foods. We have evolved to thrive while ingesting the many natural toxins in plants, and there is nothing fundamentally different about the ways our bodies cope with new artificial ones. Organic gardening often relies on new, insect-resistant varieties; one new variety of celery contains ten times as many carcinogenic chemicals as a more traditional variety. Artificial pesticides have been more extensively tested for safety than most of the things on your dinner plate. People regularly overestimate the risks of food additives and underestimate the risks of mycotoxins. Old things are generally perceived as safe, while new things are viewed with suspicion. As the authors say, "Humans are slow learners."

People regularly overestimate the risks of food additives and underestimate the risks of mycotoxins. Old things are generally perceived as safe, while new things are viewed with suspicion. As the authors say, "Humans are slow learners."

We mustn't succumb to the "naturalistic" fallacy. Greenpeace has lobbied to ban all chlorine-containing substances on the grounds that chlorine-containing organic compounds never occur in nature. But they do: on the moors of Sweden, natural decomposition of humic acid produces 400,000 tons of chlorophenols a year, and biomass releases five million tons of poisonous methyl chloride gas each year compared to a measly human contribution of 26,000 tons.

"Natural" diet myths abound. Brown sugar is no better than white sugar; in fact, it's just impure, dirty sugar that hasn't had the colored contaminants removed. Some people favor it over white sugar because of its taste or the minerals it contains, but if your aim is to get minerals, there are more of them in dirt.

The book is a treasure trove of solid science, fascinating trivia, reasoned arguments, and handy ammunition for skeptics to use in shooting down chemophobia and the naturalistic fallacy.

The galegine in goat's rue is similar to the drug metformin and both have been proven to lower blood sugar levels in diabetics. But goat's rue preparations have inconsistent amounts of the active ingredient, contain other active ingredients that are undesirable, and are more—not less—likely to cause side effects. Yet the public trust in natural medicines and distrust of pharmaceuticals leads some people to replace metformin with tisane of goat's rue.

The popular alkaline diet is based on a myth, and some of the recommended "alkaline" foods are actually quite acidic. But proving these claims to be scientific nonsense can be very difficult against the marketing prowess of the advertisers. "Marketing can be quite loud, and few people may be interested in the views of experts."

It is a myth that eating hot peppers causes ulcers. The irritant substances are only harmful in doses much higher than the amounts in spicy foods; people who eat a lot of peppers are actually *less* likely to have ulcers. Capsaicin causes the formation of a substance that benefits mucus, improves blood flow, and inhibits the growth of ulcer-causing *H. pylori* bacteria.

The authors also put fears of dioxin into context. A risk calculation in Europe estimated that dioxins in farmed salmon cause forty extra cases of cancer a year, while the fish oil in those salmon prevent 5,200 fatalities a year from cardiovascular causes. After a chemical accident with dioxin in a Monsanto plant in 1949, 122 workers were diagnosed with temporary chloracne; exposed workers were monitored for thirty years and they lived longer and were healthier than their peers. After the 1976 Seveso incident in Italy, thirty pregnant women opted to have abortions; twenty-nine of the aborted fetuses were entirely healthy, and the thirtieth had an unrelated genetic condition, Down syndrome. Long-term follow-up of exposed villagers showed no increase in the incidence of cancer. We don't have enough solid data about the toxicity of dioxin in humans to agree on a tolerable daily intake, but the human body has been exposed to it for a long time and has undoubtedly developed a tolerance to low levels. Dioxin is produced by the combustion process in wood fires, and it has been found in 8,000-year-old sediments in Japan.

The authors' discussion of bisphenol A (BPA) is illuminating. It was removed from baby bottles under the precautionary principle, not because of any credible evidence of harm. Its endocrine disrupting effects are weak to begin with, and pale in comparison with the phytoestrogens in our diet. It has been subjected to more than 5,000 studies. Its half-life in the human body is less than two hours. They note, "Taking every known factor into account . . . available evidence indicates that BPA exposure represents no noteworthy risk to the health of the human population, including newborns and babies. Is this the end of the BPA debate? Toxicologically speaking, it should be. Sociologically speaking, it is highly unlikely."

They debunk a total of 100 myths and misconceptions about foods, medicines, catastrophes, poisons, and chemicals. They cover subjects as diverse as Chernobyl, DDT, red wine, ozone, homeopathy, placebos, the heat conductivity of diamonds, detox hoaxes, the biofuel dilemma, ocean fertilization to manipulate the weather, the cause of Napoleon's death (almost certainly *not* arsenic), why ice skates slide, and even how to cook an egg.

I found their discussion of the myth of the high iron content of spinach particularly delightful. They correct misconceptions about misconceptions; it turns out the myth did *not* originate in a misplaced decimal point.

The book is a treasure trove of solid science, fascinating trivia, reasoned arguments, and handy ammunition for skeptics to use in shooting down chemophobia and the naturalistic fallacy. In the short time I've had it on my desk, I've used it as a handy reference several times. It's entertaining, accurate, well referenced, insightful, and even well written. You couldn't ask for more—except perhaps for a lower price! ■

Harriet Hall, MD, a retired physician and Air Force flight surgeon, is a SKEPTICAL INQUIRER contributing editor and an editor of the blog *Science-Based Medicine*. She writes and educates about pseudoscientific and so-called alternative medicine.

Truth, Trouble, and Research Exposing Alternative Medicine

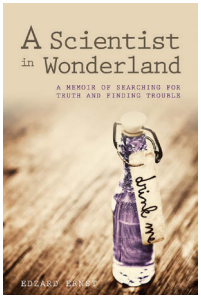
CHRIS FRENCH

If you have any interest whatsoever in complementary and alternative medicine (CAM), Edzard Ernst's new book *A Scientist in Wonderland* is a must-read. If you are already skeptical regarding CAM, you will enjoy an entertaining and informative insight into the life of a man who can reasonably claim to have carried out more high-quality research in this area than anyone else alive.

If you are a believer, there is even more reason for you to read this book. In it, Professor Ernst clearly presents his reasons, based upon sound empirical evidence, for concluding that the vast majority of CAM treatments are therapeutically worthless (over and above producing placebo effects) and that they can in some cases actually be dangerous. Furthermore, the spurious reasoning of CAM supporters is exposed for what it is, and their dubious tactics to try to silence Ernst are put under the spotlight.

The book is first and foremost a memoir. Even those of us who have long followed Ernst's research may well find a few surprises here. Ernst was born into a poor family in Germany just after World War II. His mother, described as "a most determined and in many ways an endearingly eccentric woman," was an enthusiastic user of alternative medicine, and thus the young Ernst never questioned whether or not such treatments actually had any real therapeutic value or not. He simply accepted that they did work (for all the reasons that will be familiar to regular readers of this magazine).

Ernst's first passion in life was not science; it was music—specifically jazz. He admits to being rather lazy (and at times rebellious) at school, and as a young man was much more interested in listening to and playing jazz and generally having a good time than studying. Fortunately, his mother gently pushed him in the direction of applying himself in order to get into medical school, assuring him that it would provide him with a solid profession to fall back on "if you ever get fed up with making music."



A Scientist in Wonderland: A Memoir of Searching for Truth and Finding Trouble. By Edzard Ernst. Exeter, UK: Imprint Academic, 2015. ISBN: 978-1845 407773. Softcover, £14.99.

Edzard Ernst read up on homeopathy and quickly realized that it had absolutely no plausible scientific basis—and yet he saw on a daily basis that many patients appeared to benefit from it.

If you were to assume that entering medical school provided the spark that ignited Ernst's passion for science, you would be wrong. In common with many medical students, he found that the essential requirement to master vast amounts of factual material completely precluded any time for reflection, much less the application of critical thinking.

After six gruelling years at medical school, Ernst eventually qualified as a "real doctor" and got his first job—in Germany's only homeopathic hospital. He admits to actually knowing next to nothing about homeopathy when he took up the post (homeopathy had rightly been dismissed as nonsense by his professor of pharmacology at medical school). He read up on homeopathy and quickly realized that it had absolutely no plausible scientific basis—and yet he saw on a daily basis that many patients appeared to benefit from it. When he asked the medical director at the hospital what caused this improvement in their patients, he was surprised by the candid reply: "It's mostly due to the fact that we discontinue all the useless medications they had been taking previously."

Ernst was employed in many differ-

ent and varied medical institutions over the following years in Germany and Austria, but it was not until he took up a post at St. George's Hospital in London that he truly became passionate about research, albeit in the field of blood rheology as opposed to CAM. He found being immersed in the world of scientific research exhilarating, especially the pervasiveness of critical thinking. However, he was to take up several more posts before finally landing the position that was to bring him to the attention of most readers of this magazine. Each of these appointments, in one way or another, prepared him for what was to be his final appointment before retirement.

It seems to me that the good professor has a very British sense of humor that shines through in this book.

It was in September 1993 that Ernst arrived in England, with his ever-supportive French wife, Danielle, to take up an exciting new post as the Laing Chair in Complementary Medicine at the University of Exeter. Both were already devoted Anglophiles by this time, not least because they had met and fallen in love in England many years earlier. It seems to me that the good professor has a very British sense of humor that shines through in this book. He does not believe in the rigid hierarchies based upon authority that characterized some of the continental institutions in which he had worked but instead engages in constant questioning (and sometimes gentle ridicule) of sacred cows of all kinds.

As such it should come as no surprise that he did not quite behave as many people expected him to after taking up his post in Exeter. He was committed to carrying out high-quality research into the efficacy and safety of CAM, not simply promoting its use in an uncritical manner. This admirable attitude won him much respect in the eyes of fellow scientists and the wider skeptical community. Ernst and his team published literally hundreds of papers during his time at Exeter, attracting huge interest from the media and doing vast amounts in terms of educating the wider public about the true nature of CAM.

However, his approach also won him many powerful enemies among supporters of CAM—most notably Prince Charles and his followers. In time, there were also those in positions of power at the University of Exeter whose fear of offending the British royal family led them to take steps to silence Ernst's entirely valid criticisms of CAM. Eventually, his unit was run down and he was, after almost two decades, eased out of his post.

I am pleased to say that this has not had the desired effect of silencing Professor Ernst as this book shows. Long may this man speak truth unto power! ■

Chris French is professor of psychology, Goldsmiths, University of London. His latest book is *Anomalistic Psychology: Exploring Paranormal Beliefs & Experience*, reviewed in our March/April 2015 issue.

POINT OF INQUIRY
WITH JOSH ZEPPS & LINDSAY BEYERSTEIN

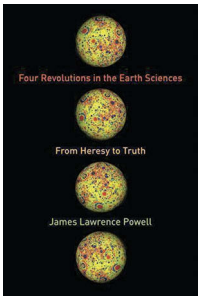
For in-depth interviews with the most fascinating minds in science, religion, and politics, join *Point of Inquiry* cohosts Lindsay Beyerstein and Josh Zepps at pointofinquiry.org.

Josh Zepps (cohost) is a new media pioneer; a journalist serving as a founding host and producer at the online talk network HuffPost Live, following hosting stints with such outlets as Bloomberg TV, the Discovery Channel, and as an anchor for CBS's Peabody Award-winning *Channel One News*.

Lindsay Beyerstein (cohost) is an award-winning investigative journalist and staff writer for *In These Times*. Her work has appeared in places such as *The New Republic*, *Reuters*, *Slate*, *Salon*, *Ms. Magazine*, and *The New York Press*. Wait to see what stories she tells with her guests on *Point of Inquiry*.

The Meaning of Consensus in Science

DAVID MORRISON



Four Revolutions in the Earth Sciences: From Heresy to Truth. By James Lawrence Powell. New York: Columbia University Press, 2015. ISBN 978-0-231-16448-1. 384 pp. $35.

The scientific skeptic recognizes that even generally accepted scientific ideas might be wrong, but as skeptics we also need the intellectual tools to understand how consensus is achieved in science and what it means. James Lawrence Powell[1], who has written several excellent books on contemporary issues in the geosciences (including *Night Comes to the Cretaceous*, *Grand Canyon*, and *Dead Pool*) and global warming (*The Inquisition of Climate Science*), was challenged to write this book by a friend who asked him how he could be so sure of the reality of global warming. After all, "science has been wrong before."

The simple answer is that scientists accept theories when the data demand that they do so. However, the *process* is not simple, and there have been times when entire scientific communities pursued dead ends and persisted in error even in the face of transformative new data.

To explore this question, Powell has analyzed four fundamental discoveries in the geosciences that are central to understanding our planet: the age of the Earth, the formation and evolution of its major landforms, the role of cosmic impacts, and the stability of our atmosphere and climate. Powell has written a compelling narrative of the ideas and personalities that shaped these big questions over the past two centuries. This is first-rate story telling, with heroes, villains, and the often-unexpected discoveries that created revolutions in our concept of our planet.

James Powell has written a compelling narrative of the ideas and personalities that shaped these big questions over the past two centuries. This is first-rate story telling, with heroes, villains, and the often-unexpected discoveries that created revolutions in our concept of our planet.

Some major themes recur in these histories. One is the conflict between traditional geoscientists and their outside critics, especially physicists. The descriptive and historical scientists often closed ranks against anyone who was not steeped, as they were, in the details. The outsiders, in contrast, insisted that their critics simply did not understand the requirements of "natural philosophy." Another recurring issue is whether descriptive data can be trusted in the absence of a full theoretical underpinning. The history of continental drift provides an example, with the compelling empirical arguments of Wegener discounted because he proposed no viable way for continents to move. Finally, there was the influence of some senior scientists who, having achieved positions of influence or authority in universities or government agencies, effectively closed the door on innovations that challenged their magisterial position.

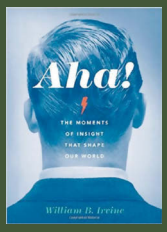
Let's look very briefly at each of these revolutions before returning to fundamental questions about whether we can be confident in any of these areas that we have finally got it right. This is especially important when Powell discusses climate science, where clearly many members of the public don't think we have it right.

Age of the Earth

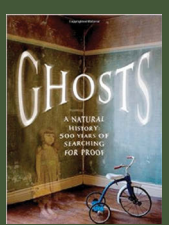
In eighteenth - and early nineteenth-century England, James Hutton and Charles Lyell defined the principles of *uniformitarianism*, asserting that the same processes that act today have always done so, in an endless cycle, with "no vestige of a beginning, no prospect of an end." To them, the question of the age of the Earth was irrelevant. The uniformitarian philosophy was challenged by Darwin's concept of biological evolution, but the most fundamental critiques came from physicists led by Lord Kelvin. He asserted that uniformitarian principles violated the laws of thermodynamics and that a sort of geological perpetual motion machine was impossible.

[NEW AND NOTABLE

Listing does not preclude future review.



AHA!: The Moments of Insight that Shape Our World. William B. Irvine. Though science typically operates on a slow, painstakingly aggregated body of knowledge, there is also an intuitive spark that often accompanies important realizations and scientific breakthroughs. Irvine, author of several books, including *A Guide to the Good Life: The Ancient Art of Stoic Joy*, examines the phenomenon and neuroscience of the aha! moment, covering creative breakthroughs and epiphanies in five subjects: science, math, religion, art, and morality. Irvine notes, "In this book I explore the way our unconscious minds give rise not to desires but to ideas. They can come to us out of the blue when we aren't seeking them; and when we are seeking them, they can play coy and refuse to appear." Oxford University Press, 2015, 376 pp., $24.95.



GHOSTS: A Natural History, 500 Years of Searching for Proof. Roger Clarke. Clarke, a writer of ghost stories and film-writer for *The Independent*, covers a lot of ground in this book, focusing on British ghost reports (from the famous Raynham Hall ghostly double exposure to the Angel of Mons story, effectively debunked by David Clarke in his book of that name). The book is an overview of interesting ghost reports and attempts to find evidence for spirits by members of the Society for Psychical Research and others. Sadly, Clarke contaminates his otherwise informative historical survey with dubious and discredited subjects such as Ted Serios (who claimed to project his thoughts onto film—"Though it was widely reported that professional skeptic James Randi had duplicated the Serios thoughtographs, his only known attempt to do so . . . ended in failure," Clarke sniffs on page 247). He gleefully cites Michael Persinger's work on the hallucination-inducing "god helmet" as an explanation for ghost experiences yet fails to account for the fact that the fields Persinger used are far stronger than anything in the environment and thus cannot account for ghost reports in non-laboratory settings—which is all of them. In short, Clarke has not done his research, and knowledgeable skeptics will find many errors and non-sequiturs (even non-skeptical casual readers will spot Clarke's sloppiness, such as repeatedly misspelling Edgar Allan Poe's name). There are much better books on the history of ghosts, such as R.C. Finucane's *Ghosts: Appearance of the Dead & Cultural*

Kelvin went further and used the principles of thermodynamics to estimate both the age of the Earth (the time needed for it to cool) and the age of the Sun (its lifetime generating energy by contraction). Both numbers were in the tens of millions of years, and the physicists asserted that older ages were "impossible."

At the turn of the twentieth century, the situation changed dramatically with the discovery of a new energy source. Radioactivity falsified Kelvin's calculations for the age of the Sun and provided ways to calculate the age of the Earth. These calculations were not easy; it required decades of improving technology to assemble the tools to do the job, and ultimately the age of the Earth was tied to the age of the oldest meteorites. The current best value is 4.56 billion years.

Plate Tectonics

One long-lived offshoot of uniformitarianism was the assumption that continents and ocean basins were permanent and immobile features of the planet. In the first decade of the twentieth century, Alfred Wegener challenged this assumption by his investigation of the Atlantic Basin, where not only do the coastlines of Africa and South America line up like pieces of a jigsaw puzzle, but the detailed geology and fossil records on both sides demonstrate continuity across what is now a 4,000-km ocean gap. The conventional explanation for these similarities (if they were acknowledged at all) was that a long land bridge had connected the two continents. Although such fanciful land bridges violated the principles of physics by alternately rising and sinking, this problem was ignored. Wegener, as an astronomer and meteorologist and even—God forbid—an Arctic explorer, became a non-person. By midcentury, the words *Wegener* and *continental drift* had been purged from geology texts. Geological history was all a matter of rising and sinking motions, never sideways.

A way out of this intellectual dead end came from new disciplines of geosciences and new people entering the field, using the remarkable advances in data collection that followed World War II. Sea-floor maps clearly showed the mid-ocean ridge where the two sides of the Atlantic had parted, and paleomagnetic studies mapped

A way out of this intellectual dead end came from new disciplines of geosciences and new people entering the field, using the remarkable advances in data collection that followed World War II.

the alternating bands of magnetism that traced the movements of continents. Today we can even measure their motion directly using GPS. In 1965, the sea-floor spreading idea was extended to plate tectonics, now the most fundamental concept of terrestrial geosciences. However, as late as the 1970s, several of the most respected senior scientists refused to accept any of this "nonsense." Powell writes, "those who continue to insist they were right the first time, in spite of accumulating evidence to the contrary, are stuck forever with their original belief."

Cosmic Impacts

Although pioneering work at the end of the nineteenth century had suggested that lunar craters were impact scars rather than volcanic features, these ideas had almost entirely disappeared by the mid-twentieth century. It was geological dogma that geologists should look at what was happening at their feet and not indulge in speculation that some cosmic intervention could solve their problems. But after mid-century a new generation of interdisciplinary "planetary scientists" was stepping up. Ralph Baldwin measured thousands of lunar craters and concluded they could not be volcanic; Gene Shoemaker's detailed field work at Meteor Crater demonstrated beyond a doubt that this particular feature, at least, was an impact scar; Nobel Laureate Harold Urey changed his major research direction to study theories of lunar origin; and a young Bill Hartmann used astronomical data to correctly estimate an age of the major lunar features of three billion years. However, most geologists ignored these upstarts. In 1964, on the eve of the first NASA lunar missions, attendees at a major conference on Geological Problems in Lunar Research were nearly unanimous that the lunar craters were volcanic. One leading speaker declared that meteorite impact is a "trivial process in affecting both the geneses and development of almost all major lunar features." In a matter of months the Ranger, Surveyor, and Apollo missions began to arrive at the Moon, and the rest is history. New data again provided the key.

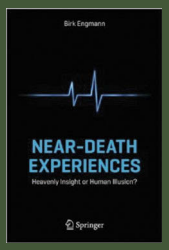
Recognition of the role of cosmic impacts in terrestrial and planetary history is now nearly universal. Powell devotes the second part of this story to ideas that are more controversial: the proposed giant impact origin of the Moon, and the role of cosmic impacts in the biological history of our planet. His earlier book, *Night Comes to the Cretaceous*, is one of the best accounts of the controversies surrounding the Chicxulub impact and the KT mass extinction. There are few scientists today who do not credit an asteroid impact with the extinction of the dinosaurs, but questions remain about the details, particularly if the KT is the only mass extinction associated with an impact. It is dangerous to generalize from a sample of one.

Global Warming

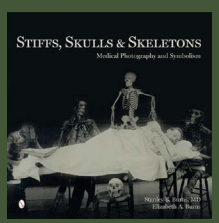
For many readers the section on global warming will be the most interesting topic in Powell's book. Here he steps back from today's headlines for a unique guide to the early history of the science behind global warming—ideas that stretch back to the nineteenth century.

The greenhouse effect was first suggested by the discovery that light rays and heat rays have different ability to penetrate glass, and were thus capable of heating the inside of a glass enclosure exposed to the Sun. In 1836, this idea was extended to the role of the atmosphere in heating the Earth, and the gases carbon dioxide and water vapor were identified as playing a similar role to the greenhouse glass. At the end of the nineteenth century, Svante Arrhenius first calculated the magnitude of the greenhouse effect and estimated that doubling the amount of CO_2 would cause a temperature rise of about 5°C. There was a problem, however: water vapor and carbon dioxide had overlapping infrared spectra, and water vapor seemed to be the dominant absorber. Therefore

Transformation; Owen Davies's *The Haunted: A Social History of Ghosts*; and (somewhat less skeptically) Peter Aykroyd's *A History of Ghosts: The True Story of Seances, Mediums, Ghosts, and Ghostbusters*. St. Martin's Press, 2014, 350 pp., $26.99.



NEAR-DEATH EXPERIENCES: Heavenly Insight or Human Illusion? Birk Engmann. An examination of near-death experiences (NDE) from a strictly scientific and neuropsychological view. The author, a neurologist and psychologist and author of many medical and historical publications, notes that with the NDE subject there is "something of a tightrope walk between rationally explainable theories and the sphere of belief." His goal is a critical review that examines how the natural sciences can throw light on the subject, a fairly novel approach in the NDE literature. He provides explanations for the experiences that do not resort to the supernatural. Engmann argues against esoteric and pseudoreligious concepts of NDE but not against religion itself. Springer, 2014, 150 pp., $19.99.



STIFFS, SKULLS & SKELETONS: Medical Photography and Symbolism. Stanley B. Burns, MD, and Elizabeth A. Burns. This lavishly illustrated book is far more than just a collection of rare, beautiful, and often grotesque images of skulls and bodies from the past 150 years. As Burns notes in his preface, part of his goal is "to put into historic perspective the use of bodies and body parts in photographic history. . . . This book includes . . . photographs of physicians who used skulls or a cadaver for documentation of their profession. The nineteenth-century study by physicians and scientists of skull features, skull capacity, and the brain as a basis for racial and intellectual theories was documented by photography." Indeed, skeptics and researchers will find many photographs relating to pseudoscience in the book, along with detailed captions and informed discussions of craniometry, phrenology, and even ghost apparitions. Chapters include dissection photography, skull studies, autopsy and forensic photography, X-rays, anatomical studies, and gallows humor. Marred only by the (understandable) high price and lack of an index, *Stiffs, Skulls & Skeletons* is a remarkable work of medical, historical, and cultural research. Schiffer Publications, 2015, 327 pp., $75.00.

—Benjamin Radford and Kendrick Frazier

most meteorologists early in the twentieth century concluded that CO_2 made only minor contributions to the atmospheric greenhouse.

Powell's original question was how we know anthropogenic global warming (AGW) is real. The simple answer is that the data demonstrate it.

Meanwhile, a key insight emerged from joint consideration of radiative and convective processes in the atmosphere. When moving heat, convection in a fluid dominates over conduction or radiation, and the lower atmosphere of the Earth is convective. Water vapor is largely confined to the lower regions, but CO_2 is the dominant absorber in the stratosphere, above the convection layers. This leads to the following simple picture of the effect of CO_2 on temperature.

1. On average the Earth must be in equilibrium, radiating the same energy it receives from the Sun, which is equivalent to that of a "bare rock" planet about 30°C cooler than the current surface temperature.

2. The effective radiating layer is primarily dependent on the carbon dioxide concentration in the upper atmosphere, where there is little water vapor. In the troposphere, heat is transferred primarily by convection and is largely independent of the infrared absorbing gases.

3. Therefore, the equilibrium surface temperature can be found by using the temperature gradient (lapse rate) in the convective troposphere to maintain the correct temperature in the stratosphere at the effective radiating layers.

4. One of the key signatures of greenhouse heating is that while the surface temperature rises, the stratospheric temperature actually declines.

Unfortunately, by the time this concept was developed the meteorology community had largely abandoned the idea that CO_2 was a major contributor to surface temperature. They took note only when evidence accumulated that the temperature was in fact rising in parallel with the increase in atmospheric CO_2, which in turn was tied to the release of carbon from burning fossil fuels.

The actual task of modeling a complex system like the Earth's atmosphere is formidable, taking into account both global atmospheric circulation and radiation, modulated by ice, clouds, and weather. Today's climate scientists are working at levels of detail unimaginable fifty years ago. But it is valuable for Powell to point out that the fundamental concepts of global warming were established even before World War II.

Powell's original question was how we know anthropogenic global warming (AGW) is real. The simple answer is that the data demonstrate it. It has become almost impossible to deny that the planet is warming, based on multiple independent evaluations of the measured surface temperatures, global remote sensing from orbit, and large-scale environmental changes, especially in the Arctic. But how do we know that the primary cause of global warming is CO_2 from burning fossil fuels? Because both theory and data show that temperatures rise with atmospheric CO_2 concentrations, and the isotopic analyses of the added CO_2 demonstrate that it came from the burning of old carbon (fossil fuel).

To go beyond these simple truths, particularly to predict the course of future warming, scientists must delve into complex calculations and computer models that are difficult for laypersons and even most scientists to judge. Here we have an advantage over the historical examples Powell cites, since there are thousands of climate scientists around the world working on these problems, checking each other's work. For example, the Intergovernmental Panel on Climate Change reports represent researchers from 195 countries, and UN rules require unanimity in approval of the report language on climate change. Today we are flooded with climate data, and ultimately it is data, not models, that matter in science.

In his final paragraph, Powell summarizes:

> Of course scientists have been wrong in the past, but they did not stay wrong. As new data arrive, scientists changed their position, some enthusiastically, some begrudgingly. A few were unable to make the transition, going to their graves clinging to their long-held positions. A new generation, with no allegiance to the old ways, came along to replace them. Thus data transform heresy into truth. ■

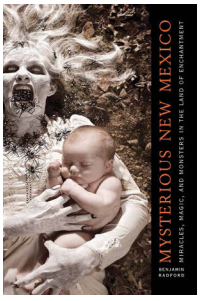
Note

Powell, a geologist and geochemist, has been president of both Reed College and Franklin and Marshall College, acting president of Oberlin College, and director of the Los Angeles County Museum of Natural History. He also served twelve years on the National Science Board, and he is now president of the National Physical Sciences Consortium.

David Morrison is a NASA senior scientist, a CSI fellow, contributing editor of the Skeptical Inquirer, and 2015 recipient of the American Astronomical Society Education Prize.

A State of Many Mysteries

SUSAN GERBIC



Mysterious New Mexico: Miracles, Magic, and Monsters in the Land of Enchantment. By Benjamin Radford. Albuquerque: University of New Mexico Press, 2014. ISBN 978-0-8263-5450-1. 300 pp. Softcover, $24.95.

Welcome to New Mexico, where I had no idea that there were odd paranormal mysteries waiting to be solved (other than in Roswell). CSI investigator (and Skeptical Inquirer Deputy Editor) Ben Radford has taken a variety of ghost stories, UFO accounts, cryptozoology, crystal skulls, psychics, and all other kinds of pseudoscience under his investigative eye in this 300-page book. Not only is the inside full of the mysterious and creepy, but the cover (featuring a scary ghostly woman holding a baby) is just amazing. It sets the tone for the contents of the book.

Full disclosure: Ben Radford is a friend of mine, and I am listed in the acknowledgment section with a thank you. So of course I'm going to say nice things about the book—but only because I really did enjoy it and am now intrigued enough that I will visit New Mexico someday soon. It's called the Land of Enchantment after all.

The book is not just about investigation of the paranormal. It is first a collection of stories, mostly ghost stories, told from the viewpoint of the media and the people who pass these stories on to the next generation. Only after Radford has intrigued us with the story does he break it down into thinkable chunks. You can see how he is thinking through how best to investigate it. What are the actual claims that can be tested and researched? Bit by bit, he relates all he discovers and all the frustrations he encounters as the stories change and the documentation that was promised by the ghost story teller does not manifest.

My favorite story was the investigation at the historic KiMo Theater in downtown Albuquerque where in 1951 a child was killed by a water heater explosion in the lobby. Many years later, a story was crafted that the child, Bobby Darnall, is haunting the theater and pulling practical jokes on the actors. People are asked to bring doughnuts and toys to appease him. Using newspaper accounts, interviewing eyewitnesses, and actually showing up at the theater to see for himself (imagine that), he was able to shut down each piece of their "evidence." I won't tell you what he finds, but let's just say that he didn't find Bobby's ghost.

Radford explains his approach to investigating. First he is not a debunker; Radford stresses that "launching an investigation with the assumption (conscious or unconscious) that ghosts are there is just as detrimental . . . as assuming that no ghosts are there."

The story of Loretto Chapel's mystery staircase is one I had heard before. I thought, Wow, they haven't figured out how that staircase was built yet? As Radford points out, by crediting the paranormal (no less than St. Joseph himself) you are taking the credit away from the real carpenter whose craftsmanship should attract tourist dollars all on its own. Shame on the Chapel for not giving François Jean Rochas his due.

Radford explains his approach to investigating. First he is not a debunker; Radford stresses that "launching an investigation with the assumption (conscious or unconscious) that ghosts are there is just as detrimental . . . as assuming that no ghosts are there." He believes to do a great investigation some time may be spent on the Internet, in libraries, and searching through old newspapers, but "being there" and talking to the people involved is also very important. The importance of original research—going back to the first source and not relying on secondhand (and more likely fifthhand) stories—cannot be stressed strongly enough. "Doing real investigation is not easy; it is time consuming, difficult, laborious, and often tedious," Radford explains.

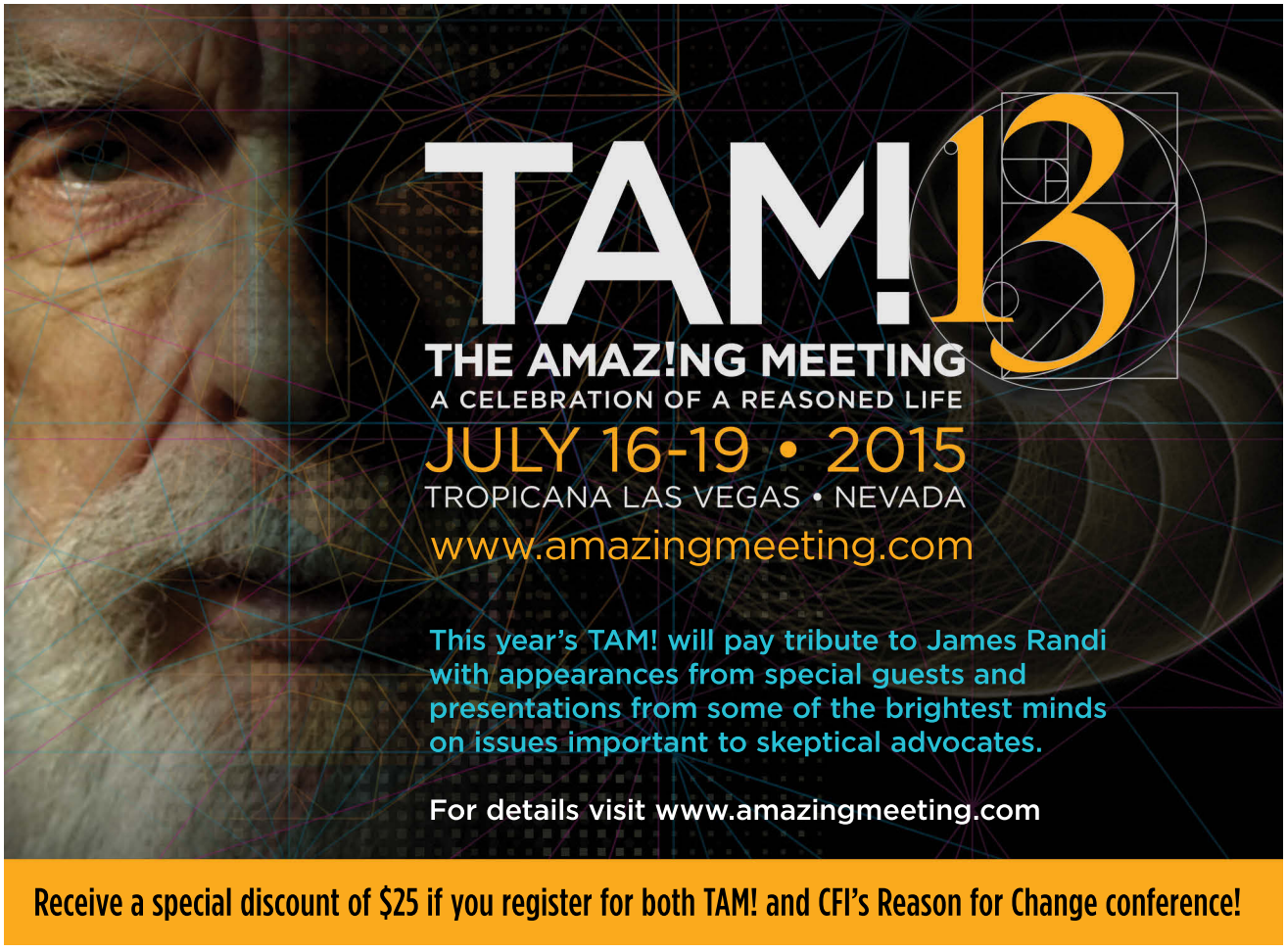
As the leader of the Guerrilla Skepticism on Wikipedia (GSoW) project, I can't help but look at every published work by our authors as a citation for

Wikipedia. This book will keep GSoW busy for a while adding the results of Radford's investigations to several pages: The KiMo Theater, Loretto Chapel, Santa Fe Courthouse ghost, Aztec UFO, La Llorona, crystal skulls, Thunderbird, West Mesa serial killer murders. That's a lot of pages that will be affected by the research done in this one book. The current Crystal Skull Wikipedia page attracts over 450 views a day.

There's one more thing that I feel strongly about, and that Radford repeatedly reminds the reader: These ghost stories are tied to real people who lived and had family that loved and miss them. Even if it was 100 years ago, it is disrespectful to think that these people are haunting hotels, theaters, and courthouses moaning about their deaths. I've always loved a good ghost story, but Radford has really made me rethink my position. When a specific person is mentioned, it ceases to be fun. I don't think I would care to hear stories about my deceased little brother eating stale doughnuts and playing pranks in a theater. I found that the city of Albuquerque's website tells Bobby's story complete with the front page of the newspaper talking about the accident. I don't understand why a city website would feel the need to continue spreading ghost stories. They list three ghost websites with a version of this story, but no link to Radford's Skeptical Inquirer article where he first reported on the KiMo Theater ghost (May/June 2009, also online on CSI's web page, at http://www.csicop.org/si/show/ghosts_doughnuts_and_a_christmas_carol_investigating_new_mexicos_haunted_ki/). I've asked them to comment and at the time of this writing have not yet heard back. I learned a lot about the mysterious New Mexico from Radford, but the bigger lesson was that reminder: we should be considerate of the feelings of the families these stories are based on.

Radford has traveled all over the world investigating cryptids, ghosts, chupacabras, vampires, miracles, and more. Readers will be glad to see that Radford, at least this time, has found the mysterious can be found everywhere, even in New Mexico. ■

Susan Gerbic is the cofounder of the Monterey County Skeptics and leader of the Guerrilla Skepticism on Wikipedia project. You can learn more at SusanGerbic.com.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Why Do People Believe in Gods?

Gary Bakker's article "Why Do People Believe in Gods. . . .?" (January/February 2015), focusing on Deborah Kelemen's research on teleological thinking, provided a nice, compact analysis of how this innate tendency gives insight into the universality of theistic belief. But Kelemen's model, for all its explanatory power, provides only a "proximate" explanation for individual belief, not an "ultimate" explanation of the ontology of religion. Her research gives insight into why individuals believe, why children can be Christians, and why belief is easy while science is hard.

But Kelemen's model doesn't give us an understanding of the larger picture. Why religion in the first place? Why are theistic belief systems universal? Why do all large, multifaceted societies have omniscient, moralizing gods?

What Bakker needs to do for SI's readers is to take a look at the work of psychologists such as Ara Norenzayan, Joseph Henrich, and their colleagues whose broader theoretical framework provides insight into the much larger role of religion in society—then report back. (See Norenzayan, *Big Gods: How Religion Transformed Cooperation and Conflict*. Princeton Univ. Press, 2013; and Norenzayan et al., The cultural evolution of prosocial religions. *Behavioral and Brain Sciences*. In press.)

Their approach begins with primitive functions such as agency detection and ends with the role of "big" gods in enabling large societies to emerge. It's worth noting that their theory doesn't diminish the importance of Kelemen's research. In fact, it incorporates her work as an insightful account of individual belief systems.

Arthur S. Reber
Point Roberts, Washington

Gary M. Bakker raises some interesting arguments in his attempt to explain why so many people continue to cling to God belief and assorted superstitions in the absence of compelling empirical evidence, but I fear he overlooks several salient points. First, he neglects to note, let alone explain, the marked decline in such beliefs and the increase of a secular, scientific based worldview in various European nations, most notably in Scandinavia, as well as in Japan, where ancestor worship has long been on the decline. Why have these countries been more immune than the population of the God-fearing USA from the various factors cited in Bakker's article that contribute to the acceptance of irrational beliefs?

More significantly, Bakker does not mention two key elements in understanding why millions of people adhere to particular religious or non-evidence-based beliefs, namely, indoctrination and learning. Like most people, I did not freely embrace the faith I was raised in or choose to believe in miracles and a deity; rather, in my case I was taught to believe in Catholicism by my parents, other family members, and priests, and had to learn about the various doctrines of that religion, such as the Trinity, the Virgin Birth, and blind obedience to a celibate and authoritarian clergy. None of the reasons cited by Bakker were factors in my becoming a Roman Catholic. In other cultures, children are indoctrinated from birth to believe in and absorb different sectarian or secular creeds (think Iran and North Korea) and have no choice in the matter.

I managed to free myself from religion and to embrace atheism as a teenager when I became interested in astronomy and world history and broadened my intellectual horizons. However, most people do not abandon their faith, or if they do, they often become converts to another one as nonsensical, if not more so, than the one they left. I believe the reasons for this are more complicated than the ones cited in Bakker's article.

In short, while Bakker may have explained why irrational beliefs arose among primitive humans in the distant past, he should have noted that said beliefs have managed to endure into modern times, often with complex and elaborate doctrines, thanks to brainwashing starting from birth. Perhaps Bakker can write an article that focuses on how a minority of Americans raised in irrational belief systems has managed to become freethinkers and skeptics in the face of family opposition and a society openly hostile to a rational and secular worldview.

Dennis Middlebrooks
Brooklyn, New York

Both of the articles on why we believe seemed to ignore social factors, which I think are some of the biggest reasons people believe false things.

Most people, including myself at one time, believe in religion primarily because virtually all the people they trust the most agree these things are true. In addition, long-lasting religions are successful because they contain powerful hooks that make them hard to get out of. We may be shunned or punished or killed if we openly disagree. We're taught to distrust anyone who questions the orthodoxy. We're shamed by martyrs who died for the cause, and in the case of Christianity we feel we owe a huge debt to Jesus, who endured a horrible punishment in our place for sins that we committed. We are also told that without our religion evil would run rampant. Major religions are well adapted for survival.

As to conspiracy theories and the like (Preston Bost, "Crazy Beliefs, Sane Believers: Toward a Cognitive Psychology of Conspiracy Ideation," January/February 2015), proponents gain a lot of ego satisfaction from believing they are open minded while the rest of us are gullible, and they love the idea that they are the enlightened ones who must warn the rest of us about issues of vital importance.

Recognizing social factors like these is important for understanding false beliefs.

Bob Korn
Cary, North Carolina

In your January/February 2015 issue, you once again tackle the question so many of your readers ask themselves: How can the vast majority of human beings believe in supernatural beings?

What we often miss is that the concept of a deity and its worship is an invention: a very effective invention that has provided a great many benefits to mankind and civilization. Even a partial list of these benefits show the power of this idea:

- Explains the unexplainable
- Controls the uncontrollable
- Conquers death
- Justifies our actions
- Provides succor
- Encourages group cohesion
- Provides a basis for ethical commandments
- Assures justice for all
- Provides societal control of the poor by the rich
- Protects the poor from the rich

All this wrapped in a package of exciting and compelling stories that are easy to understand and easy to pass on.

The genius of religion is that it has become woven into the very fabric of what it means to be human.

It is not enough for nonbelievers to decry the irrationality of these beliefs. If we are to be successful, we must replace them with a worldview that provides the same set of benefits. This is not going to be easy. Mankind has had thousands of years to refine the appeal of gods. Can we do it? Should we do it?

Dick Robertson
Wilmington,
North Carolina

I found Bakker's article well written, informative, and interesting, particularly when he ended with a striking, relevant quote from the Bible. He presented several current positions that attempt to explain the near ubiquitous belief by humans in a "higher power."

I would have enjoyed the article even more if Dr. Bakker had offered a science-based explanation for this near universal belief.

The science-based theory I prefer uses the fight or flight nature of early reptilian brains to make the case that survival occupied every minute of every day for practically all life-forms, particularly in a prey- or predator-organized world. Over many millennia, the compelling need to survive, juxtaposed against the inevitable fact of death, eventually led (among *Homo sapiens*) to the construct of an afterlife. Now, there are countless examples of afterlives, mostly religious based, which allows our still partially reptilian brain to quiet the anxiety created by the need to survive at all cost by cleverly devising a life-beyond-death story that is genetically transmitted to the offspring of each and every generation. Thus, the life after death construct implies the existence of a higher power.

I hope that future Skeptical Inquirer editions will include articles that delve into a more rational treatise on Why Do People Believe in Gods? I love the publication. Please keep the informative, thought-provoking articles flowing.

Roger Brumley
Santa Fe, New Mexico

I thoroughly enjoyed Bakker's article and his conclusion that promiscuous teleological intuition, as explained by Deborah Kelemen and her research colleagues, fills the gaps in previous conclusions.

Young children, when awareness dawns in their brains, do not know the difference between living and non-living natural objects and therefore attribute "living" characteristics to inanimate objects as well. They also have to start to understand the position their caregivers have in their lives. These are the authorities they have to deal and negotiate with; they learn to obey the rules whether they make sense or not and are dependent on, and learn from, the reaction of their parents.

Using Occam's razor, it seems logical that, later in life, when weaned from parents they replace their parents by other authoritative figures as well, i.e., gods and goddesses. That explains why God(s) are often described as parents whose authority should not be questioned and whose actions and decisions are not always understood but should be obeyed to avoid punishment. Ancestor worship is an important part of other religions as well.

We can therefore characterize teleological delusions as the failure of thinking independently. The cure as mentioned by Gary M. Bakker is a high level of education to satisfy our insatiable curiosity as soon as we are capable of abstract thinking.

Benjamin V.W. Andrews
Barrie Ontario, Canada

Criminal Profiling

Laurence Miller ("Flaw and Order: The Science and Mythology of Criminal Profiling," January/February 2015) concludes that "criminal behavioral profiling will no doubt ultimately be found to occupy a middle ground somewhere between infallibility and psychobabble." No doubt? Given behavioral profiling's lack of theoretical basis and absence of demonstrated validity as summarized by Miller, there should be plenty of doubt about its future.

The most likely explanation for behavioral profiling's scientific shortcomings is not "growing pains in the maturation of a behavioral science," as Miller posits, but rather that behavioral profiling is a pseudoscience that cannot be validated because it isn't based in reality.

Joseph Keierleber
Portland, Maine

Randi's Escape

Much as I admire James Randi, I am skeptical of the account of his escape from prison as retold by Massimo Polidoro (January/February 2015).

Polidoro recounts that there were five prison cells, each with a door that locked individually. In addition, the doors were "locked . . . with a bar on top of the cells that went all the way down the corridor and had little pegs at each cell that hooked into the top of the doors. It . . . could be operated only from outside the cell block."

Randi was put in one cell (call it #1) and his clothes were in the cell furthest away (#5). He escaped from #1 by keeping that door ajar when the bar at the top was locked from outside, thus preventing the peg that secured his door from engaging. He then opened his cell door with the duplicate key he had hidden in his shoe, retrieved his clothes from #5 because his key "could open all the [individual door] locks in the block," and left the building through a washroom window.

Just a moment! Cell #5 with his clothes was secured by the bar. He was never in that cell before he escaped, so he couldn't have defeated the bar mechanism at the top of that door. Even with a key, how could he have opened that door?

Lawrence I. Bonchek, MD
Editor-in-Chief, *Journal of Lancaster General Hospital*
Lancaster, Pennsylvania

Massimo Polidoro replies:

Yes, thank you, I think there's a point that somehow I overlooked: The fact is that Randi did not actually open the cell #5, for they had bars: he simply put his hand inside and took the clothes through it. However, I don't know how my mistake slipped through!

Controversy in Canada

I was happy to see your news article "Aboriginal Cancer Treatment Controversy in Canada" in the January/February 2015 issue because I feel this story has received insufficient national coverage across Canada. To be sure, the *Hamilton Spectator* is covering the cases involved, but the *Spectator* is a local paper. The CBC has reported on the issue, and it was discussed in the *Globe and Mail* and (I believe) the *National Post* (both papers with Canada-wide distribution), but the use of "traditional medicine" has hardly become a major topic of discussion in Canada.

I was also happy to see this article because First Nations issues in general have acquired strong political overtones in Canada. Should the courts decide that McMaster University Children's Hospital and child welfare authorities have the right/obligation to intervene in such cases, it promises to cause strong reactions. It should be remembered that 2015 is an election year in Canada.

Here is an update that your magazine and Paul Benedetti, who wrote the original article, may find interesting: it would seem that the eleven-year-old girl at the center of one of the cases discussed has died. A news article in the *Hamilton Spectator* reported this on January 20 ("Aboriginal Girl who Refused

Chemo Dies").

Finally, I believe your article provides an excellent overview of the facts in this case, but it does cover "just the facts." Given that most articles in your periodical take clear and vocal positions on the issues they raise, I am most anxious to know your writers' opinions on this issue.

Paul Guillery
Montreal (Quebec)
Canada

CO_2 Correction

In the article "Some Popular Global Warming Factoids" (November/December 2014), author John Eades accidentally left out a few key words in a paragraph on page 53 under the "Exhaled CO_2. . . ." subheading. Consequently the phrase a) ". . . *the additional 346 litres is just what we absorbed from* . . . " should really have been: b) ". . . *the additional 346 litres is just what we regenerate from the carbon we absorbed from.* . . ." The implication of a) is that we absorb CO_2 directly from plant material, while in reality we absorb carbon. (The "closed loop" conclusion is not affected of course.)

Correction

The Skeptical Inquirer, Volume 38(4), July/August 2014, included an article by Harriet Hall titled "Faith Healing: Religious Freedom vs. Child Protection." This article included a sentence that read:

"Josef Smith, eight years old, was beaten to death during an exorcism in Tennessee. His parents, members of the Remnant Fellowship, were found guilty of murder and sentenced to life in prison plus thirty years."

Please note that the fatal beatings that killed Josef Smith occurred in Georgia not Tennessee, and that Joseph and Sonya Smith deny that the beatings were part of an exorcism.

The sentence should read:

"Josef Smith, eight years old, was beaten to death in Georgia. His parents, members of the Remnant Fellowship, were found guilty of murder and sentenced to life in prison plus thirty years."

[FEEDBACK

The letters column is a forum on matters raised in previous issues. **Letters should be no longer than 225 words**. Due to the volume of letters we receive, not all can be published. Send letters as email text (not attachments) to letters@csicop.org. In the subject line, provide your surname and informative identification, e.g.: "Smith Letter on Jones evolution article." Include your name and address at the end of the letter. You may also mail your letter to the editor to 944 Deer Dr. NE, Albuquerque, NM 87122.

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TO BELIEVE OR NOT TO BELIEVE
OMG. SERIOUSLY?!
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SKEPTICAL ANNIVERSARIES

by Tim Farley

May 2005: Skeptic podcasting begins with *Skepticality* and *Skeptic's Guide to the Universe* both posting their first episodes during the first week of May. There are now approximately 100 skeptical podcasts worldwide.

May 5, 1995: Hoaxer Ray Santilli first screens his "alien autopsy" footage in London; it would air on Fox television in August.

May 9, 1950: L. Ron Hubbard's self-help book *Dianetics: The Modern Science of Mental Health* is first published and would later become the basis for Scientology.

May 11, 1950: Two UFO photos taken in McMinnville, Oregon, become among the best known after they are published in *Life* magazine. The town still holds an annual UFO festival.

May 12, 1915: Anna Mae Foy becomes the first licensed chiropractor in the U.S., under new regulations passed in Kansas.

May 28, 1965: Connecticut becomes the first U.S. state to require municipalities to fluoridate their municipal water.

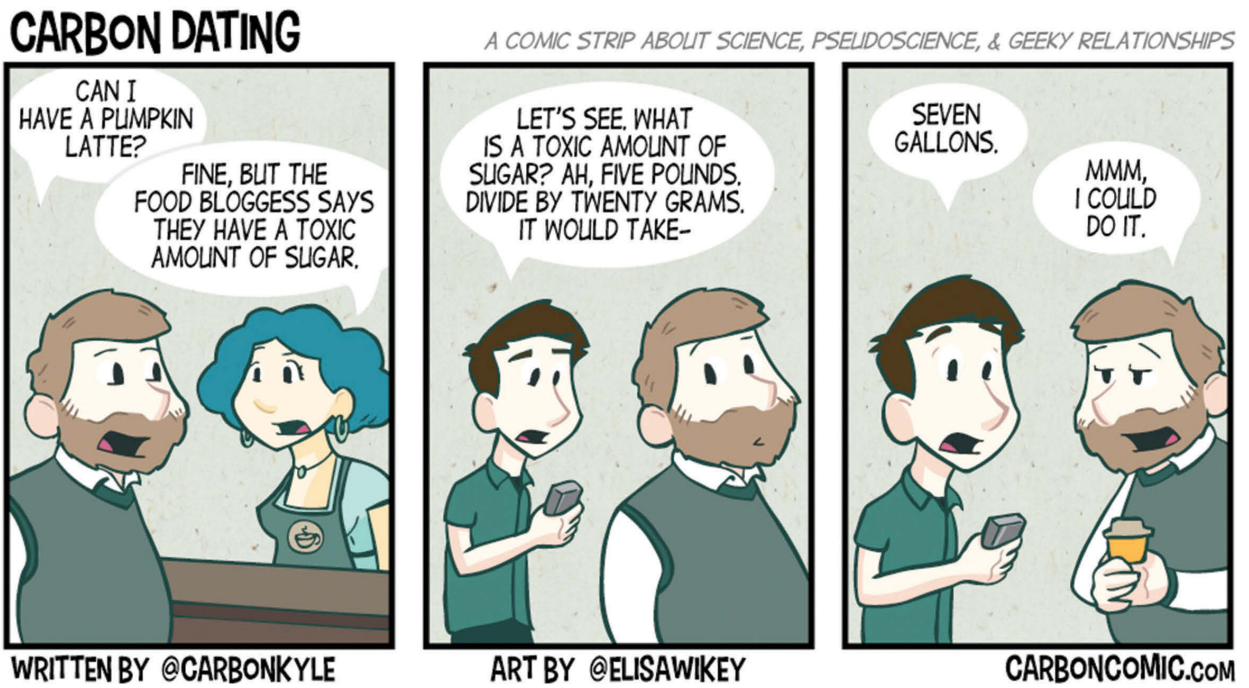
June 6, 1875: Mary Baker Eddy holds her first services in her new church, later called Christian Science.

June 7, 1955: Dr. Henry Beecher presents his influential paper, "The Powerful Placebo" at the 104th meeting of the American Medical Association.

June 8, 1990: Belgian skeptic group SKEPP (Studiekring voor Kritische Evaluatie van Pseudowetenschap en het Paranormale) is founded.

June 16 & 20, 2005: Robert F. Kennedy Jr.'s article about mercury in vaccines, "Deadly Immunity," is published by Salon.com and *Rolling Stone*. Salon retracted the article in 2011 after critics "eroded any faith we had in the story's value."

Tim Farley is the creator of the website whatstheharm.net and blogs at skeptools.com. He is a past fellow of the James Randi Educational Foundation.


CARBON DATING
A COMIC STRIP ABOUT SCIENCE, PSEUDOSCIENCE, & GEEKY RELATIONSHIPS
CAN I HAVE A PUMPKIN LATTE?
FINE, BUT THE FOOD BLOGGESS SAYS THEY HAVE A TOXIC AMOUNT OF SUGAR.
LET'S SEE. WHAT IS A TOXIC AMOUNT OF SUGAR? AH, FIVE POUNDS. DIVIDE BY TWENTY GRAMS. IT WOULD TAKE-
SEVEN GALLONS.
MMM, I COULD DO IT.
WRITTEN BY @CARBONKYLE
ART BY @ELISAWIKEY
CARBONCOMIC.COM

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